ARMY RESEARCH AND DEVELOPMENT

MAY-JULY 1977

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SPEAKING ON . . .

Communicating for Public Understanding of Defense Problems

GEN Bernard W. Rogers

ARMY CHIEF OF STAFF GEN Bernard W. Rogers was the guest speaker at a luncheon during the May 26-27 Atlanta IV Army/Industry Executive Seminar on Systems Acquisition Initiatives and Communicating Up - Flowing Down. GEN Rogers stressed the need for improved communication to achieve more knowledgeable public understanding of Army problems and requirements related to the national defense structure. JACQUES S. GANSLER, Deputy Assistant Secretary of Defense (Materiel Acquisition), discussed a New Direction in the Acquisition Process as the keynote speaker at a Conference on Tactical Missiles, April 27, at the National Bureau of Standards, Gaithersburg, MD. The full text of GEN Rogers' address is followed by that of DASD Gansler.

Jacques S. Gansler

It is a great pleasure and privilege to be here for my first Atlanta seminar. I am convinced the exchange of views that takes place at seminars such as this with representatives of the military and industry are extremely useful. I note that this morning you have discussed subjects important to the Army, issues such as research and development and readiness testing, and you also had as your first topic one of extreme importance, communications.

You are interested in communications down and I understand that is what the panels are all about this afternoon, to find out if the word is getting down. Well, you are probably as interested as we are in communications *up*, in the filtering system that happens in the Army as you go from the top down; all those that say, "I don't believe it, this is what I think the old man really wants" or "well, I hear what he's saying," and throw it in the trash can.

All of those kinds of things are very important but to get that feedback up, that is what we are looking for in the Army today, because we are interested in customer satisfaction just as you are. We need that feedback from the soldier and considerable effort has been spent on getting it.

What I want to talk about today is communication from another perspective, that between us and the American people, and when I say us, I mean you and me and the rest of the Army - communication on the need for sufficient funds for military manpower, for research, development, testing and evaluation, procurement, for maintenance and for sustainability of the force.

We in defense and defense-related industries have a special responsibility to explain the facts of life to the American people. As makers and users of defense materiel, we are the ones who know about technological innovations, who know about battlefield requirements, who know about capabilities, and who know where the money is going and why.

So I will be talking about communicating with the American people on defense spending from three aspects: Thinking about defense spending, talking about it, and looking at it. Then, at the end, I want to tell you some of my concerns in the form of questions.

When Americans think about defense spending, their thoughts are often conditioned by the traits that you find in our country, in our national makeup. I am talking about antimilitarization, isolationism, idealism and materialism.

In 1784, the year after the Revolutionary War, Congress decided, and made the statement, that large standing Armies in time of peace are inconsistent with the principles of the republican form of government, and are generally converted into destructive engines to establish despotism. And with that they reduced the Continental Army to 100 officers and men stationed at Fort Pitt and West Point.

Some of you will recall that in the constitutional convention, one of the delegates stood up and offered a proposal that the constitution forbid an Army larger than three to four thousand. George Washington, who was also a delegate, leaned over and said, "That's fine so long as we prohibit an enemy to attack us with a force larger than three or four thousand."

That has been the thinking in this country ever since, and the net result has generally been one of unpreparedness. Yet, when great effort was needed, once we were aroused, that effort was expended.

It is particularly pleasing to me to have the opportunity to participate on a platform established by ADPA (American Defense Preparedness Association) and NSIA (National Security Industrial Association) that has as one of its responsibilities, and its primary one, to see to it that we are not unprepared in the future.

When I talk about great effort being expended in spite of the national trait that we have had, and the experience we have had of being unprepared, I am reminded that in 1940 we were preaching isolationism in this country. Idealists refused to spend money on a military force which ranked 17th in the world; yet when attacked we mobilized eight million men and the most formidable war machine the world has seen.

In the spring of 1950, Congress could not find $13 billion for defense. But when our interests were threatened in Korea, that same Congress found $50 billion for it.

So we see these traditional thought patterns at work today in some areas: new isolationism, idealism, especially strong antimilitarization, which I believe is waning but still powerful, and materialism, "what's in it for us?" And you and I, I believe, have the responsibility to see that these attitudes don't push us into unpreparedness as they have done in the past.

We have to continually remind the American people of the realities of the modern world. We don't have the buffers we once enjoyed, the oceans, the British Navy. An attack against our forward deployed forces could start with very little warning, almost no warning.

This means no longer do we have the time to mobilize the forces in the industrial base and we just have to be ready now. We must be prepared to fight and win with forces, equipment and material that we have on hand at any moment in time.

Getting this message across is complicated by the ways we talk about defense spending. The defense budget has always been a handy whipping boy in peace time. There are times when one would think that the defense costs were out of control. But the facts are that social welfare costs take a greater percentage of the federal budget than defense costs.

Our real expenditures for defense are lower than at any time since before the Korean War. The size of the Armed Forces is lower than at any time within the past 25 years; we have less than half as many people in uniform as the Soviet Union. And that country exceeds us in production rates for almost all categories of military equipment. Now I must admit, we Americans have a trait that we tend to talk in superlatives. Critics of the defense budget exaggerate the case to get public attention, but so do we. We have been guilty of exaggerating for emphasis.

There is nothing particularly sinister about that. But it does hurt when things are really in bad shape. Sometimes it is almost impossible to convince the public that you are not exaggerating again just for emphasis.

As I read the tea leaves for the future, we are going to have to continue to make our case and make it very strong if, in fact, sufficient resources are going to be allocated to the Armed Forces to perform the mission that the American public expects.

The way we look at defense spending is also an important factor. We have often justified defense spending by defending it largely as protecting the America homeland—the "fight them over there or we'll be fighting them in Atlanta" response.

The truth of the matter is that we have fought the majority of our wars not to protect the homeland, but to protect our national interests, vital national interests in other areas in the world, and to protect our freedom of action on the international scene. This is harder to explain, but we must make this case if we are going to retain our credibility with the American people.

Again back to strategic realities. The Soviet Union is a threat to this country. This country must depend upon allies. Critics complain that we base our budget on comparisons with the Soviet forces who guard thousands of miles of hostile borders in Europe and Asia. What they don't say, however, is that the Soviet Union is a continental power and all it has to do is to mass its forces within its own borders and it causes problems in Northeast Asia, in the Middle East and in Western Europe.

We, on the other hand, located as we are, must project that power if we, in fact, are going to bring influence to bear. This reality places a high premium on forward deployed forces, as we have in Northeast Asia and in Europe, and on our airlift and sealift capabilities to reinforce those forward deployed forces.

(Continued on page 31)

ABOUT THE COVER:

Progress in global satellite communications technology was the theme of the display panels here depicted, as shown during the Bicentennial Celebration of the founding of the United States. The displays were shown again at historic Fort Myer, VA, named after the founder of the U.S. Army Signal Corps, BG Albert J. Myer, whose tombal monument was the scene of a wreath-laying ceremony there during the 21 June 1977 celebration of the Corps' 117th anniversary. Featured in this edition, page 21, is a 7 June report on a remarkable feat of satellite communication using the Army's new AN/PSC-1 manpack 25-pound radio; also, page 2, NASA's consideration of a concept to launch communications satellites from the Space Shuttle craft.

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FEATURES

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Selective Scanner

DARCOM Forwards Smoke/Aerosols Technology Plans

Smokes (screening) and aerosols research and exploratory development plans, tailored to an expanded base for renewed Army interest in these technologies, were forwarded May 31 by HQ U.S. Army Materiel Development and Readiness Command (DARCOM) for Army approval.

The plans are the result of a series of meetings of the Smoke/Aerosol Steering Group (SASG) chartered by DARCOM in February 1977. The thrust of the effort is coordination of inputs from all interested Army laboratories to develop a series of smoke plans.

SASG is chaired by the Army project manager for Smoke/Obscurants. Members are representative of Armament R&D Command (ARRADCOM), Electronics Command (ECOM), Human Engineering Laboratory (HEL), Harry Diamond Laboratories (HDL), Mobility Equipment R&D Command (MERADCOM), Missile R&D Command (MIRADCOM) and Test and Evaluation Command (TECOM).

Integrated in the plans will be the entire Army technology-base effort in the development of new smoke systems; also, evaluation of the influence of United States and foreign inventory and developmental smokes and natural aerosols on Army systems and functions.

Monitorship of technology evolving as a result of the work conducted under these plans, and periodic updating of plans, will be performed by the SASG.

NASA Probing Satellite Launches From Space Shuttle

Under contract with the National Aeronautics and Space Administration, involving compatibility of components development, researchers are working with five manufacturers of communications satellite systems.

Envisioned through this Battelle Columbus (OH) Laboratories study is the possible savings of millions of dollars in the 1980s for the communications industry by use of the Space Transportation System (STS). NASA is interested in developing a Spinning Solid Upper State (SSUS) for deployment from the shuttle system.

The concept is that one SSUS will be able to carry a communications satellite to the desired orbit, such as a geosynchronous orbit, and that several SSUS can be carried on each space shuttle flight. The shuttle is being developed for the nation's scientific, military and civil space programs.

After separation from a shuttle craft 160 miles above the Earth, the SSUS will propel the communications satellite into a typical elliptical transfer orbit with a perigee of 19,300 miles. The satellite then will fire its own propulsion motor to go into circular orbit.

Nine spacecraft from the five manufacturers are involved in the study. The resulting SSUS criteria will be supplied to NASA's Marshall Space Flight Center at Huntsville, AL. NASA will contract for system definition phases.

Contract Calls for STE/ICE Limited Production

Limited production and preparation for large-scale production of the STE/ICE automotive test system are specified in a recent $1.8 million Army contract award.

Denoting Simplified Test Equipment for Internal Combustion Engines, STE/ICE is capable of performing more than 50 types of diagnostic tests and maintenance checks on a wide variety of engines and accessory systems.

The contract with RCA Corp. is the latest in a series of awards dating to 1971 when STE/ICE concept studies were initiated. The objective is to make diagnosis by testing easier, faster and cheaper than diagnosis by parts replacement.

The system was initially applied for use on only four types of Army vehicles but is now capable of testing 15 different varieties, including armored personnel carriers, trucks, jeeps, self-propelled howitzers, tanks and recovery vehicles.

Contract terms specify that RCA's Automated Systems Division will begin assembly of 25 advanced production systems, followed by further evaluation by the Army. Options for larger quantities may be exercised this year.

HDL Completes XM1 Low-Level EMP Tests

Completion of electromagnetic pulse testing of the XM1 tank at the HDL Woodbridge (VA) Research Facility was announced June 16 by the U.S. Army Harry Diamond Laboratories, Adelphi, MD.

Low-level EMP tests at Woodbridge enabled Chrysler Corp., XM1 producer, to validate analytical predictions and investigate upset modes for the tank's major subsystem components.

Featuring a 105mm cannon as its main armament, augmented by a .50-caliber and two 7.62mm machineguns, the XM1 uses a new AGT-1,500 turbine-powered engine to attain double the power, cross-country speed and mobility of current U.S. Army tanks. Weighing 58.9 tons, the XM1 has an X1100 automatic transmission with four speeds forward and two in reverse.

Delivery of the first pilot model to the Army is scheduled in early 1978 and the current Chrysler contract requires delivery of 11 pilot tanks and associated hardware over a 3-year period.

DoD Weighs Army/Navy Joint Helicopter Training

Cost saving estimates vary regarding what could be achieved by consolidation of a helicopter training program for the U.S. Army and Navy, but Department of Defense and Army Comptroller General studies show the economy would be substantial.

In recommending to Congress that the training be consolidated, with the Army managing the program, the Comptroller General estimated that up to $23 million annually could be saved. Congressional conferees rejected the proposal and asked the Department of Defense to re-evaluate results of an earlier study.

The revised DoD estimate of savings is $13.8 million but the Army Comptroller General explained the $9.2 billion difference by factors he believes were not considered.

Retirement and veteran's benefit cost savings, he said, could add $5.8 million annually to the DoD estimate. Eliminating base operating costs associated with Navy helicopter pilot training, he explained, could save an additional $3.4 million.

Helicopter pilot training currently is conducted by the Army at Fort Rucker, AL, and by the Navy at Pensacola Naval Air Station, FL. Air Force pilots also are trained at Fort Rucker.

BMD Radar System Tracks ICBM Reentry Vehicle

Nearly a month ohead of the development and test schedule, the Army's second-generation ballistic missile defense system radar has demonstrated, in its first full-scole test, ability to trock an intercontinental bollistic missile (ICBM) reentry vehicle.

Used as port of the Systems Technology Test Facility at Kwajalein Missile Range in the Pacific Ocean, the radar detected, ocquired ond trocked a Minuteman ICBM launched from Vandenburg Air Force Base, approximately 5,000 miles awoy.

Progressively more difficult target complexes will be tracked in tests scheduled over a period of several months. The Systems Technology Program is planned to investigate and evaluate various potential BMD systems.

Attention will be focused on solutions to key technical problems that would be involved in developing the systems, and reducing development, test ond field deployment lead time.

The Systems Technology Test Facility, consisting of an integrated radar, data processor and software, is operated by McDonnell Douglas Astronautics Co. for the Army BMD Systems Command, Huntsville, AL.

AAMRDL Demonstrates UTTAS Flight Capabilities

Flight capabilities of the Army Utility Tactical Transport Aircraft System (UTTAS) were demonstrated May 19 to a group of officers ond key civilian personnel of the Army Tronsportation School at Fort Eustis, VA.

Many of the concepts and components of the UTTAS were developed at the Fort Eustis Directorate of the Army Air Mobility Research and Development Loboratory (AAMRDL), headquartered at the NASA/Ames Reseorch Center, Moffett Field, CA.

Robert Berisford, chief of the System Support Division of the Fort Eustis Directorate of the AAMRDL, said its personnel developed the crashworthy crew seats, crashworthy fuel system, fluidic stobility augmentation system which helps to keep the UTTAS stable while in flight, and the technology for the aircraft's T-700 engines.

Still being intensively tested, the UTTAS (UT-60A) is expected to be delivered to field elements in 1979. Delivery of at least one prototype to the Fort Eustis directorate is scheduled in August 1978.

Army officials have estimated thot, in addition to its numerous performance advantages over current helicopters, the UTTAS will effect cost sovings up to 40 percent - since 15 UTTAS can replace 23 Huey helicopters in an aviation assault company.

Contracts Total $92 Million for Projectile Components

Award of four multiyear contracts totaling $92 million for production of projectile components hos been announced by the U.S. Army Armament Moteriel Readiness Commond and the Armament R&D Commond.

Granting of contracts for three years rather than one is expected to net the Army savings of more than $30 million, the announcement stoted. This method is designed to permit contractors to extend time required to amortize their investments and to stabilize their work forces.

Heckethorn Manufacturing Co., Dyersburg, TN, is receiving $37.4 million for production of grenades for the M483A1 155 and the M509 8-inch artillery projectiles. Fuzes for these projectiles will be provided by Doyron Corp., Orlondo, FL, at a cost of $18 million; E. Walters Co., Inc., Elk Grove Village, IL, for $19.3 million; and Etowoh Manufacturing Co., Gladsden, AL, for $17.1 million.

Both programs are managed by COL Ralph J. Cook Jr., project manager for Selected Ammunition at the Armament R&D Command, Dover, NJ.

$25.6 Million Awarded for Missile Minder Production

Production of the Missile Minder (AN/TSQ–73), a computerized command and fire control system for the Hawk ond Nike Hercules missile systems, is ordered in a $25.6 million contract announced by the U.S. Army Missile R&D Command, Redstone Arsenal, AL.

Housed in a small shelter which can be moved by truck, plane or helicopter for rapid deployment, the Missile Minder can coordinate air-defense capabilities and communications with the Navy, Marine Corps and Air Force.

The system features the latest in electronic and computer technology, receives processes and disploys target information from various radars, and assigns the appropriate Hawk or Hercules battery to counter a threot. Requiring fewer operators than its predecessors, it hos faster reaction time ond is considered more relioble and easier to maintain.

COL Monte J. Hatchett, director of MIRADCOM's Army Air Defense Command ond Control Systems, will administer the contract. Army Tacticol Dota Systems Project Manager MG William J. Hillsman, assigned to Fort Monmouth, NJ, heads over-all system development.

Study Group Analyzing Reserve Training Systems

Establishment of a study group to analyze ond evaluate the full-time training and administration systems of the Selected Reserve was announced in June by the Department of Defense.

MG Francis R. Gerard of the New Jersey Air National Guard is heading the group ot Fort McNoir, Washington, DC, and the review will include pertinent recommendations of the Defense Manpower Commission and the House Armed Services Committee. The study unit is expected to complete its review in early fall and submit its report to Secretory of Defense Horold Brown.

Included olso are the technician program and all current systems used to provide day-to-day commond, control, odministration, recruiting, equipment maintenance and operation, instruction and training for Selected Reserve.

ARRADCOM Managing 2 Navy Projectiles R&D

Responsibility for developing the U.S. Navy Semi-Active Laser-Guided 5-inch and 8-inch Projectiles has been assigned to the U.S. Army Armament Research and Development Command (ARRADCOM), Dover, NJ.

Both programs will be controlled by ARRADCOM's Project Monoger for Cannon Artillery Weapons Systems (CAWS), COL Ronold E. Philipp, and will enter engineering development this summer. CAWS includes responsibility for developing and fielding the Army's Copperhead, a 155mm Cannon-Launched Guided Projectile (CLGP).

The dual-service development program will moximize component commonality to minimize costs and plons are being made to augment CAWS staff with Navy personnel.

R&D News...

DARCOM Cites Industrial Firms at Atlanta IV Seminar

One of the features of the Atlanta IV Executive Seminar, sponsored by the American Defense Preparedness Association (ADPA) and the National Security Industrial Association in cooperation with the U.S. Army Materiel Development and Readiness Command, was the presentation of outstanding achievement plaques to 14 industrial firms.

Upon the conclusion of the ceremony, DARCOM Deputy Commanding General for Materiel Development LTG George Sammet Jr., who presented the honorary awards, was surprised as the recipient of a similar award presented by DARCOM Deputy CG for Materiel Readiness LTG Eugene J. D'Ambrosio.

LTG Sammet was commended for his achievements in furthering the Army-Industry cooperative effort to produce more effective weapon systems (particularly with respect to Reliability, Availability and Maintainability) within the constraints of design-to-cost goals. He was acclaimed also for his leadership role in arranging and conducting the series of Atlanta seminars.

Okay Industries, New Britain, CT, was cited for "exceptional accomplishment . . . dedication, innovative thinking and technical excellence in developing .22 caliber conversion kits for the M-16 rifle . . . ammunition for training . . . and (estimated) savings exceeding $13 million annually." Cited also was a "700 percent improvement in reliability over the specified requirement, and 50 percent greater accuracy than its prototype, all at unit cost savings 20 percent below the original government estimates."

Gulf & Western Industries Inc., Swarthmore, PA, was cited for support of the Army Small Caliber Ammunition Modernization Program (SCAMP). Results are termed "a leap forward" from World War I and II technology. "Computer-controlled, high-speed case and bullet manufacturing systems . . . are now operating with outstanding results, such that the Army realizes a saving of $10 for 1,000 rounds . . . a vastly improved capability to reduce stockpiles and respond to national emergencies, and deliver higher quality ammunition . . . ."

Honeywell Inc., Minneapolis, MN, was cited for support to the Army as a "major fuze producer." The citation continues: "Since 1951, Honeywell has been one of the best in the fuze business . . . work has covered a wide range of technologies and applications. Over the past 10 years, Honeywell has delivered to the government over 800 million fuzes and has established a functional reliability rate better than 99.5 percent . . . has pioneered automation . . . and process control, providing the Army capability to meet emergency needs with a quality product . . . ."

THE "GEORGE AND GENE SHOW," which has been a popular series of briefings on DARCOM's composition, capabilities, mission and procedures during recent months, is cast in a different role—with LTG Eugene D'Ambrosio presenting an honorary plaque to LTG George Sammet Jr., whose retirement Sept. 1, ends 35 years service.

Emerson Electric Co., St. Louis, MO, was cited for "development of the winning prototype in the Army's Improved TOW Vehicle (ITV) program. Emerson delivered prototypes on schedule that met the Army's challenging technical and operational requirements . . . sound technical approach promises early fielding of this urgently needed weapon system."

Magnavox Government & Industrial Electronics Co., Fort Wayne, IN, was cited for "expanding the capability for production of thermal imaging common modules. At a time when the Army was faced with a critical need for additional production sources for common modules . . . successfully demonstrated through its vast experience in far infrared design that commonality of components could be attained through more than one production source . . . has helped . . . the Army to realize all the benefits it had planned for in future production of night vision components and systems . . . ."

Marinette Marine Corp., Marinette, WI, was cited for "technical expertise and performance while under a Navy contract to produce and deliver to the Army 1600 series utility landing craft . . . delivered its first LCU on target and proposes to deliver the last craft eight months ahead of schedule . . . discovered and corrected numerous problems in the government furnished technical data package, making it possible to deliver a craft of high quality within cost . . . ."

Hughes Helicopters, Division of Summa Corp., Culver City, CA, was cited for winning the AAH helicopter competition by "successful-

(Continued on page 23)

DARCOM DCG for Materiel Development LTG George Sammet Jr. presents achievement plaques to (counterclockwise from right) E. J. Okay for Okay Industries; John J. Byrne, Gulf & Western Industries Inc.; Dr. James Renier, Honeywell Inc.; John Burge, Emerson Electric Co.; James T. Smith, Magnavox Government & Industrial Electronics Co.; Roger DeRusha, Marinette Marine Corp.; Thomas Stuelpnagel, Hughes Helicopters, Division of Summa Corp.; Robert Whalen, Martin Marietta Corp.; Harry Wall, Automated Systems,, RCA Government and Commercial Systems; Eugene J. Tallia, United Technologies Corp., Sikorsky Aircraft Division; Winton S. Smith, The Singer Co.; Emiel Nielson, FMC Corp.; and Alfred Mugford, White Consolidated Industries Inc.

Progress in Leukemia Research. . .

WRAMC Investigators Report Results

Keys to more effective treatment of leukemia — that is, extending the period of remission to more than double what it was slighly more than a decade ago — are being shaped through research at Walter Reed Army Medical Center, working with many U.S. medical researchers.

Formerly when a child or an adult became afflicted with leukemia, the life expectancy could be a matter of months for infants to a considerably longer period of progressive physical deterioration for older patients. Now some child patients at Walter Reed have been under treatment, using various drugs, for 10 to 12 years.

Dr. (LTC) Frederick B. Ruymann of Walter Reed's Department of Pediatrics, recognized as an authority in hemotology, terms leukemia treatment a "relatively young science." In his opinion, substantial progress has been made since the first breakthrough in treatment was reported by Dr. Sidney Farber of Harvard University in 1948.

Children suffer from a variety of differing forms of leukemia, he states, adding that the odds of a child under 15 developing the disease are about one in 2,800, except for those having Down's Syndrome, a genetic disease known as mongolism. The odds then increase to one in 95. In cases of identical twins, if one develops leukemia the chance that the other will become afflicted is one in five.

Usually when a child is diagnosed as having the disease, the body contains about a kilogram (2.2 pounds) of leukemia cells, about a trillion.

The first objective in treatment toward achievement of remission is to reduce the total to about a million cells - a point at which stem cells in the bone marrow seem to resume production of normal, red, white and platelot cells.

Following diagnosis to determine accurately the particular type and count of leukemia cells, intensive treatment begins immediately, using chemotherapy. Walter Reed's early experimentation used one drug about six weeks, followed by another drug and then a third for similar periods before rotating back to the first drug for a second cycle.

Further research showed that combination of the drugs produced more effective treatment, except that some resulted in toxic effects. Dr. Ruymann reports current effort is directed toward minimizing toxic reaction but obtaining the most effective treatment possible. Once remission is achieved, the follow-up treatment at WRAMC is usually about five years, but other hospitals are studying the possibility of shorter periods.

"During this time," he explains, "we try to give direct treatment to some hiding places of leukemia cells. At St. Jude's Hospital, in Memphis, TN, for example, it was discovered that about one-third of their patients required treatment in the cranial-spinal axis."

Treatment employed radiation to the brain and doses of methatrexate in the spinal column, which lessened damage to bone marrow, infection and bleeding, and growth alteration. Dr. Ruymann described reduction of side effects as important because of the increased number of patients who live to be adults.

Successful results of white cell transfusion with cells supplied by the blood bank's cell separator open another avenue of hopeful experimentation. Results of research since 1969 will be published soon in the *Southern Medical Journal.*

WRAMC medical researchers have given transfusion treatment to more than 100 children, Dr. Ruymann said, explaining that they are of "great value in fighting infections during the period before the bone marrow comes back after chemotherapy has reduced diseased white cell count to a desired level, when an infection could prove fatal.

White cells from healthy donors are used. An IBM cell separator employing centrifugal force separates most of the red blood cells from the white cells, but donors must have the same blood type as the patient. A high-pitched warning sounds when a donor's blood flow drops slightly, indicating the machine will stop.

Leukemia patients, in more WRAMC recent research, have been able also to obtain platelet transfusions to prevent bleeding.

Regarding future leukemia research, Dr. Ruymann is optimistic that optimal application of drugs now in use will extend the 5-year survival rate of about 50 percent of patients to about 80 percent. Remembering that a cure for leukemia appeared imminent about 11 years ago, he said:

"Getting that additional 30 percent will be a lot tougher . . . ."

White Sands Tests Demonstrate Patriot, Hawk Compatibility

Patriot missile system testing at White Sands Missile Range, NM, intercepted a jet fighter June 2 while its single-phased-array radar simultaneously supplied acquisition and tracking of a second target to an Improved Hawk missile battery.

Conducted in a severe countermeasures environment, including firing of the second target drone, the test demonstrated compatibility of the Improved Hawk - mainstay of the Army's current medium-altitude capability - and Patriot, its eventual successor.

Patriot acquired the first target at long range and high altitude. The Patriot missile, without a warhead, intercepted the long-range target within the lethal radius of the missile warhead. Simultaneously searching, the radar fingered the tiny Firebee drone, streaking in at low altitude, and the Improved Hawk battery scored a direct hit.

The intercept also marked the latest major test for the system under direction of MG Charles F. Means who has served as Patriot project manager for four years. The general will take command of the U.S. Army Missile R&D Command at Redstone Arsenal, AL, July 15. (See page 41).

General Means said he leaves pleased with progress of the program and deeply appreciative of the support he and Patriot received from everyone involved. "The people behind this program, the government/contractor team, are professionals, dedicated to success, people who work hard and love their work. They can complete the task if they get the funding stability and support they deserve in the next two and one half years. I hate to leave them."

Patriot began its long string of test successes in 1973, leading up to the most recent series which began in December 1976 and proved the system's capability to perform its mission despite use of a wide variety of countermeasures designed to degrade the system. There were eight successful flight tests and 24 search/tract tests that validated the system's outstanding capabilities to counter the airborne threat of the 1980s and beyond.

Test Pilot Terms XV-15 Aircraft 'Most Impressive'

Design concepts for a radically new type aircraft, originated more than a quarter century earlier, came to successful fruition in May when the XV-15 tilt-rotor research model was acclaimed by a test pilot as "the most impressive airplane I have ever flown."

Making its initial hover flight at the Bell Helicopter Textron Arlington Flight Research Center, Fort Worth, TX, the XV-15 lifted off the ground with the nacelles positioned in the helicopter mode for a 5-minute hover and low speed demonstration.

Sharing the controls were project pilots Dorman Cannon and Ron Erhart. "Control inputs about all axes were made and the aircraft response was as expected," commented Erhart — adding that "the aircraft handled exceptionally well." Cannon said that "flying qualities were beyond what we had anticipated for a first flight."

Under a joint contract with the National Aeronautics and Space Administration and the U.S. Army Air Mobility Research and Development Laboratory of the Aviation Systems Command, Bell Helicopter Co. is working to perfect the design, manufacture and test of two VTOL (Vertical Takeoff and Landing) tilt-rotor research aircraft.

The No. 1 plane's next phase of development calls for additional ground tie-down tests, a 50-hour airframe and transmission inspect, and installation of the remote control system. The research model than will be delivered to the NASA/Ames Research Center at Moffett Field, CA, for wind tunnel tests. Completion of assembly of No. 2 is expected in late June.

Designed to incorporate the best features of helicopters and conventional airplanes for fast point-to-point transportation, the tilt-rotor concept feasibility was first demonstrated in 1951 - under a joint Air Force/Army contract with Bell. Results established that efficient operation could be achieved in both hover and forward flight modes with easy conversion.

XV-15 Tilt-Rotor Research Aircraft

New OBTVR Office Manages DARCOM CM/CCM Programs

Countermeasure/Counter-Countermeasure (CM/CCM) programs of the Army are being managed within a new Office for Battlefield Technical Vulnerability Reduction. OBTVR was established in June by the U.S. Army Materiel Development and Readiness Command at Harry Diamond Laboratories, Adelphi, MD.

The OBTVR will coordinate with the U.S. Army Training and Doctrine Command (TRADOC) Combined Arms Center (CAC) at Fort Leavenworth, KS, to ensure that technical and tactical CM/CCM alternatives are provided to Army developers throughout the materiel acquisition and life-cycle processes.

Directed by the Deputy Chief of Staff for Research, Development, and Acquisition (DCSRDA), this action will increase the Army's ability to operate and survive in a CM/CCM battlefield environment. The potential adversary's extensive CM capabilities have been identified by the U.S. Department of Defense intelligence community as a definite threat.

The OBTVR will assist developers in preparing materiel requirements documents and testing requirements; also, in developing and maintaining technical recommendations concerning CCM to project managers (PMs) and development centers. The CM/CCM data base effort will integrate and continually update resources of industry and the military services.

Staffed by 5 military and 19 civilian personnel, the OBTVR is organized into a Systems Analysis and Test Methodology Branch, Technology Branch, and Systems Branch. The mission is to consider systems involved in, or relying on, the transmission, emission, reception, or reflection of signals by electromagnetic, sonic, seismic, olfactory or optical means. Effects of electromagnetic pulse (EMP) upon nuclear weapons also will be considered.

Current projects include the Patriot antiballistic missile defense system countermeasures assessment, smoke/electro-optics, and XM1 main battle tank signature assessment. The new office is continuing efforts of the Patriot Vulnerability Studies Office.

The office also provides assistance to the PM for Smoke by chairing a working group in intelligence and integrated CM/CCM for on-board armored vehicle protection systems. Active support is provided to an Army steering committee for planning and programing smoke and smoke-related research in the 6.1 (basic) and 6.2 (exploratory development) areas.

The OBTVR participates in DARCOM's near-millimeter (0.3mm to 2.4mm) Wave Technology Base and Planning Study Panel. Coordinating with the Combined Arms Center, the office will plan for testing, advise on development of test methodologies, and independently assess test results for selected elctro-optical systems in a smoke environment.

Interfacing with the intelligence community, CAC, PMs and development centers, the OBTVR will seek to ensure that proper resources are utilized to provide operational and survivable equipment in a CM/CCM battle

The address for the Office for Battlefield Technical Vulnerability Reduction is: Commander, Harry Diamond Laboratories, ATTN: DRXDO-RAF, 2800 Powder Mill Road, Adelphi, MD 20783 (Autovon: 290-3160, commercial: 202-394-3160).

BRL Disbands 37-Year Scientific Advisory Committee

Thirty-seven years after it was established, the Scientific Advisory Committee of the Ballistic Research Laboratory at Aberdeen Proving Ground, MD, has been abolished and three long-time members were honored for their roles.

When formed in 1940, the committee was composed of a group of eminent scientists and engineers who advised the BRL director on technical aspects of ballistic weapons R&D.

Meeting several times a year, except in 1971-72, the committee was credited with recommending programs leading to a number of notable scientific achievements, including development of the world's first all-electronic digital computer and the construction of full-scale supersonic wind tunnels in the United States.

The three honored long-time members are:

- Prof. Joseph E. Mayer, an expert in statistical and quantum mechanics, Revelle College, University of California, San Diego, La Jolla, a member at various times from 1942 to 1977.
- Dr. Homer J. Stewart, a professor in the Department of Aeronautics, California Institute of Technology, Pasadena, whose specialties are dynamic meteorology, theoretical aerodynamics, fluid and supersonic flows, guided missiles, and space and planetary exploration systems. He served from 1959 to 1977.
- Retired Army MG Leslie E. Simon, Winter Park, FL, a specialist in quality control, statistics, proof testing and surveillance of munitions, and exterior ballistics. He was a member from 1956 to 1977. Other 1977 members:
- Retired Army LTG Austin W. Betts, Southwest Research Institute, Houston, TX, Army Chief of R&D until December 1970.
- Dr. J. V. Richard Kaufman, Great Falls, VA, recognized as an expert in explosives, radio isotopes, ultrahigh speed photography, solid state chemistry and radiation damage.
- Charles L. Poor, Washington, DC, long-time Deputy Assistant Secretary of the Army (R&D) until he retired in 1975, and an established expert in exterior ballistics, weapons technology and systems engineering.
- Prof. Morris Rubinoff, Moore School of Electrical Engineering, University of Pennsylvania, renowned for research in systems engineering, computer logic design, electronic circuit design, and mathematical analysis.
- Prof. Martin Summerfield, Princeton University, honored for his work in infrared spectroscopy, soil erosion, rocket propellants, combustion and jet engines.
- Herbert K. Weiss, Palos Verde Peninsula, CA, acclaimed for achievements in aeronautical engineering, fire control and systems analysis.

Members of the first BRL SAC in 1940 were: Dr. Hugh L. Dryden, National Bureau of Standards, then known as an authority on aerodynamics; Dr. Albert W. Hull, General Electric Co., inventor of the thyratron and developer of the screen grid vacuum tube, member of the National Academy of Science; Dr. Bernard Lewis, U.S. Bureau of Mines, authority on gaseous explosions and flames; Prof. Isadore I. Rabi, Columbia University, discoverer of the radio frequency spectra of various molecules in a magnetic field, member of the National Academy of Science; and

Prof. Henry N. Russell, Princeton University, eminent astronomer and astro-physicist, foreign member Royal Society of London, member National Academy of Science; Prof. Harold C. Urey, Columbia University, discoverer of heavy hydrogen or deuterium, recipient of the Nobel prize in chemistry, member of the National Academy of Science; and Dr. Theodore von Karman, director, Guggenheim Grade School of Aeronautics, California Institute of Technology, authority on aerodynamics and a member of the National Academy of Science; Prof. John von Neumann, Institute for Advanced Study, Princeton, NJ, authority of the theoretical foundation of quantum mechanics, member of the National Academy of Science.

TEAMWORK IS REPRESENTED by the above group responsible for deprocessing and issuing the last M60A2 Tank under the U.S. Army Materiel Development and Readiness Command (DARCOM) "Hand-Off" project in U.S. Army, Europe (USAREUR). The project also set the stage in preparing for "Hand-Off" of the M60A1 (Passive) Tank in USAREUR beginning in July 1977, and the M60A3 in 1979. Front row (l. to r.) are SFC Raymond Ferullo, SFC John Teller and SFC William Brand, Project Manager (PM) M60 Tank Development Office, Vilsek, Germany. Second row: Bob Kuchis, U.S. Army Armament Materiel Readiness Command (ARRCOM), Rock Island, IL; Don Warner, Watervliet Arsenal, ARRCOM; Jack Elsner, U.S. Army Tank-Automotive Materiel Readiness Command (TARCOM), Warren, MI; Bill Barton, assistant chief, Deployment Control Office, PM 60 Tank Development; Walt Szpunar, team chief, TARCOM; Ed Hallahan, Frankford Arsenal, ARRCOM; Mike Kuniak, U.S. Army Communications and Electronics Materiel Readiness Command, Fort Monmouth, NJ.

TESTFACS Register Aids DARCOM SIDTC Program Requirements

Single Integrated Development Test Cycle (SIDTC), one of the U.S. Army Materiel Development and Readiness Command's high-priority programs to reduce costs and improve management of materiel acquisition, is being aided by a new tool.

The DARCOM Test Facilities Register, known as TESTFACS, is a 2-volume reference with the second volume programed for completion in August 1978. TESTFACS already has about 1,200 Volume I users among Department of Defense agencies and contractor personnel. Being updated and expanded to serve more effectively their requirements, Volume I will be available soon in its revised form.

The purpose of the TESTFACS register is to facilitate identification and selection of test capabilities by materiel developers under the SIDTC concept — to integrate valid test requirements into cost-effective development.

TESTFACS is a tool for contractors, development and operational testers, and evaluators. It is expected to aid greatly the planning efforts of Test Integration Working Groups — especially in developing resources of the test program.

A principal SIDTC objective is to reduce time and costs by eliminating duplicatory testing, i.e., performance of identical or similar tests by the contractor and the Army. A direct corollary to this objective is maximizing use of existing testing capabilities. Precluding unwarranted test facility duplication results in further reduction in time and costs.

For example, cutting the test cycle of the Hellfire missile program by 90 missions resulted in $138 million savings and reduced the time to achieve initial operation by about one year.

Several other materiel programs have been similarly streamlined. Implementation of SIDTC has emphasized the possibility of better understanding and control of test facilities during the materiel development process.

DARCOM Deputy CG for Materiel Development LTG George Sammet Jr., in a letter to RDT&E field activities, held that it was fundamental for developers to have facilities responsive to basic local needs related to developmental/engineering problems.

Care should be taken, he said, to avoid establishing a development testing capability that has more widespread, general application — and more properly should be located in the U.S. Army Test and Evaluation Command (TECOM) and managed as a Service-wide asset.

Use of the Test Facilities Register is considered to be indispensable for adherence to the DARCOM policy. Volume I, prepared in looseleaf format for general reference, describes test facilities, including instrumentation, worth more than $50,000 each.

Intended primarily for use by test managers in initial detail planning, and published as DARCOM Pamphlet 70-1, it lists and describes testing capabilities at 20 DARCOM installations and activities. These test facilities belong to the following major subordinate commands:

TECOM; ARRADCOM (Armament Research and Development Command); AVSCOM (Aviation Systems Command); ERADCOM (Electronics Research and Development Command); MIRADCOM (Missile Research and Development Command); and TARADCOM (Tank-Automotive R&D Command).

In addition to the major subordinate commands, there are test facilities at five organizations that report directly to DARCOM, namely: Electronics R&D Command, Provisional ERADCOM, formerly the Harry Diamond Laboratories; Human Engineering Laboratory (HEL); Army Materials and Mechanics Research Center (AMMRC); Mobility Equipment R&D Command (MERADCOM); and Natick R&D Command (NARADCOM).

TESTFACS Volume I describes each of about 1,080 significant test capabilities within DARCOM, along with environmental features and constraints. Information is provided on projects that received recent test support, along with the breakdown percentage of effort devoted to research, development and production.

Volume I, as expanded, will include 2-page summaries on each of more than 50 contractors and 30 other Department of Defense activities which provide testing capabilities and/or services to DARCOM. Information in over-view-type coverage has been prepared to parallel that of the more detailed DARCOM in-house format.

TESTFACS is the culmination of more than a year of study group effort headed by Gerald W. Hayes. An Army civilian employe for more than 30 years, he is backed by a wide range of experience in TECOM operations and logistics.

The study group consists of key HQ TECOM personnel operating under a charter as tasked by HQ DARCOM. Hundreds of DARCOM personnel are participating in the study by providing descriptive data on test facilities dispersed throughout DARCOM.

This first-of-a-kind test register has been made possible by the highly cooperative efforts of the DARCOM RDT&E community and by the contractors and other Department of Defense activities which were requested to participate.

Volume II will be an automated catalog of test instrumentation within DARCOM. It will be a complete roll-up of the DARCOM inventory of more costly or unique test equipment and will show, on computer printouts, where items are located, how they are used in testing and what capabilities each possesses.

TESTFACS II is programed to help determine if a specific testing capability exists at a DARCOM element; it will aid selection of testing alternatives, and will promote cross-utilization of DARCOM's test instrumentation assets.

Volume II will compile data inputs provided by DARCOM elements and work is well under way, augmented by a 15-month contract for ADP services. Computerized printouts, the first of which are expected in November 1977, will progressively cover DARCOM test instrumentation. A full cataloged inventory of unique/costly instrumentation is targeted for August 1978.

Point of contract for the TESTFACS Register is the DARCOM Test Facilities Study Group at TECOM, Autovon 283-2103/2294.

Mobility Equipment R&D Command Plans FAMECE Prototype Tests

Government prototype qualification tests will be performed on the Family of Military Engineer Construction Equipment (FAMECE) this summer, following contractor testing and delivery of the test units in July to the U.S. Army Mobility Equipment R&D Command (MERADCOM), Fort Belvoir, VA.

FAMECE is designed to increase capabilities of engineer combat organizations by replacing a number of wheeled construction vehicles with a single common power module that can be coupled to any one of eight work sections, i.e., dozer, loader, dumper, water distributor, grader, scraper and two compactors.

Weight and size constraints were put on the power pod and individual attachments to make them light enough to be airlifted and paradropped by aircraft of the 1970s. Despite weight and size restrictions, the vehicles have demonstrated a high horsepower-to-weight ratio which allows them to perform construction missions without assistance. The vehicles have a road speed in excess of 30 mph for convoys.

Replacement of the many makes and models of construction equipment now in combat engineer organizations with the FAMECE vehicles is expected to reduce management, logistics, training requirements and support costs.

Development of FAMECE is controlled by the project manager at HQ MERADCOM.

FAMECE

Army Type Classifies Improved Universal Engineer Tractor

Federal government efforts are being directed to full-scale production of the improved Universal Engineer Tractor (UET), type-classified Standard recently after acceptance testing at Aberdeen Proving Ground (APG), MD, and field tests at Fort Hood, TX.

Developed under the project manager for FAMECE/UET (Family of Engineer Construction Equipment), U.S. Army Mobility Equipment R&D Command (MERADCOM), Fort Belvoir, VA, the UET reportedly has demonstrated that it has achieved, after an extended period of prototype problem-solving design changes, the over-all mobility, versatility, maneuverability, reliability and readiness maintainability required to support combat forces.

The multipurpose, tracked vehicle can doze, scrape, rough-grade, tow, dump and haul in performing earthmoving tasks required for combat engineer operations. Features include a ballast concept to keep its 32,000-pound weight within the limits for air transport, airdrop, and high cross-country mobility. In testing it has provided the work capacity of a heavier unit.

When loaded with eight cubic yards of soil, the additional weight almost doubles the vehicles's empty earthmoving (grading) capability. The 285-HP diesel engine has test demonstrated that it provides more than enough power for all operations.

With a speed of 30 mph on level ground, the UET gives the combat engineer the mission capability to keep pace with highly mobile armored units. It also is fitted with light armor protection and has a limited swim capability of 3 mph.

BRLESC Computer Gives Way to New Central-Site Facility

BRLESC (correct spelling for the benefit of those who can recall the heydey of burlesque) was dedicated Mar. 20, 1962, at the U.S. Army's Aberdeen Proving Ground, MD, as the world's finest computer — the pride of the multibillion dollar industry spawned also at APG with ENIAC during World War II.

The April 1962 edition of the *Army Research and Development Newsmagazine* reported on the BRLESC (Ballistic Research Laboratories Electronic Scientific Computer) dedication ceremonies and "The Computer Tree" as "planted" by the U.S. Army. Traced along its limbs was the evolution of the industry from its inception. Pictured below were four lovely ladies showing models of progressively miniaturized components.

ENIAC, EDVAC, ORDVAC and BRLESC all were sponsored or developed by the Ballistic Research Laboratory. All are now in the category of "Gone with the Wind" of change. BRLESC is the last to go, yielding place to an $18 million computer system that will be installed in phases, beginning in August.

Michael J. Romanelli, chief, Management Information Systems Support Division, MISD, Armaments R&D Command, contributed to this report of the new system — scheduled for acceptance testing in September and operation in October — by providing details on the installation of the replacement for BRLESC.

Competitive procurement resulted in initial awards of $9.1 million to Control Data Corp., Minneapolis, MN, and Vector General Inc., Woodland Hills, CA. The CDC award includes a large central site facility and 76 remote terminals. Vector General Inc. will provide four remote graphics terminals and an interface to the CDC central site facility.

Initial installation for the central site facility and 76 remote terminals will have a phased expansion of site resources and an additional 76 remote terminals. Completed cost will be about $18 million.

Government furnished communication lines from the central site to 30 remote sites will provide service to the organizational elements of the Ballistic Research Laboratory, the Army Materiel Systems Analysis Activity (AMSAA), and the Human Engineering Laboratory (HEL), all collocated at Aberdeen Proving Ground, MD.

The central-site facility will consist of two major processors, namely: a CYBER 170/173 with host communications processors, data channels, card readers, punches, high-speed printers, magnetic tape handlers, control consoles, extended and immediate access storage devices; also, a CYBER 70/76 with control console, and extended and immediate access storage devices. Remote facilities will include a variety of interactive, batch, data-acquisition, and graphics terminals.

Contract specifications include successful execution of a 2-part benchmark with stringent time, space, data-transfer, input-output, interrupt, and accuracy requirements of large, complex, scientific and engineering applications, and demonstration of various software system capabilities.

The central-site will be connected to the BRL ARPANET Controller (PDP11/ANTS) via a 100,000 bit per second, serial full-duplex interface providing access to and from the DARPA (Defense Advanced Research Projects Agency) network. Training in use of the system was started in June.

Army Science Conference Call for Summaries of Papers

Narrative one-page summaries of technical papers proposed for presentation at the 1978 U.S. Army Science Conference, June 20-22, at the United States Military Academy, West Point, NY, must be received by Oct. 17.

Chairman of the Army Science Conference Dr. Ivan R. Hershner Jr., assistant director for Research Programs, Office of the Director of Army Research, stated that 100 of the proposals will be selected for presentation. About 20 additional papers will be on the alternate standby list.

Sponsored as it has been from the beginning in 1957 by the Deputy Chief of Staff for Research, Development, and Acquisition (formerly the Chief of R&D), the 11th ASC will offer in-house laboratory bench-level scientists and engineers an opportunity to report on significant progress in research oriented to foreseeable military materiel applications.

An expected audience of about 400 U.S. Government and allied government defense officials and key scientists and engineers will provide a forum.

Based on previous Army Science Conferences, the Army Incentive Awards Committee is expected to provide $3,500 to $4,000 in honorariums for authors of the best papers. Winners will be selected prior to the ASC by a panel of judges representative of the major scientific disciplines.

The most prestigious award will be the 3-inch silver Dr. Paul A. Siple Memorial Medallion, presented at the 1976 ASC to each of five members of a 5-man team from the Benet Weapons Laboratory, Watervliet, NY. The medallion honors one of the U.S. Army's most noted polar and cold regions explorers, and an Army scientific adviser until his death in 1968.

Authors of other major papers will be presented bronze medallions and honorariums. Meritorious paper authors will receive Certificates of Outstanding Achievement signed by the Assistant Secretary of the Army for Research and Development and the Deputy Chief of Staff for Research, Development and Acquisition. All papers presented will be published in proceedings, and, consistent with national security, widely disseminated.

Narrative Summary Submissions of papers proposed for ASC presentation must represent original work performed in Army R&D installations. They may be classified through SECRET but must not contain Restricted Data or Formerly Restricted Data. *Submission through channels is required.*

Authors within the U.S. Army Materiel Development and Readiness Command will address summaries to Dr. Gordon L. Bushey, Office of Laboratory and Development Command Management, HQ DARCOM, 5001 Eisenhower Ave., Alexandria, VA 22333.

Corps of Engineers proposals will be submitted to Terence G. Kirkland, Chief, R&D Office, Office of the Chief of Engineers, Washington, DC 20314.

Army Medical Departments proposals will be addressed to COL Phillip E. Winter, deputy chief of staff for Research Plans, U.S. Army Medical R&D Command, Washington, DC. *All other authors* should submit summaries to Dr. I. R. Hershner Jr., assistant director for Research Programs, Office of the Deputy Chief of Staff for Research, Development, and Acquisition, Washington, DC 20310.

'Stretch' Program May Extend M113A1, M548 Vehicle Bodies

Extension of the body of the Army's M113A1 armored personnel carrier and the M548 cargo carrier may result from an exploratory development program under way at the U.S. Army Tank-Automotive Research and Development Command, Warren, MI.

Results of a feasibility study indicated that by extending vehicle cargo compartments about 26 inches, cargo volume and swim payload capabilities of the vehicles would be significantly increased over those of standard size counterparts, thus increasing combat and support role effectiveness.

Actually part of a larger vehicle modernization effort, the "stretch" program started in 1976 and will include improved suspension and engine cooling systems, and increased engine power.

Two stretched test rigs of the M113A1 and one extended M548 are being prepared in joint effort by the Fabrication Division of TARADCOM's Engineering Support Directorate and FMC Corp., San Jose, CA.

Four unserviceable M113A1 hulls were initially cut into two sections so that the length of two of the front sections was 60 percent of total original length. These front sections were then welded to longer rear sections from the other two vehicles to form the extended hulls.

Following delivery to FMC, the two M113A1 hulls were outfitted with engines, transmissions and suspension components. The M548 extended version will be built by FMC.

Features of the stretched vehicles will include an extra set of road wheels for added support, a turbocharged 300-horsepower engine, an improved transmission and hydrostatic steering.

David M. Latson, M113 system manager at TARADCOM, noted that the M113 test rigs will be evaluated for use as a forward-area ammunition resupply vehicle for combat tanks and self-propelled artillery, or as an ambulance or forward-area maintenance vehicle.

Completion of the user evaluation is programed this year. A decision on use of the M548 as a potential refueling vehicle may require an additional four to six months of study.

Competitive Contracts Order GSRS Advanced Development

Competitive contracts will initiate advanced development of the free flight artillery rocket system in August, the U.S. Army Missile Research and Development Command has announced. Known as the General Support Rocket System, the GSRS is programed for distribution to users in the early 1980s.

The call for bids went out in mid-April to 31 firms and they have until May 31 to submit proposals for a mobile, tracked launcher. The GSRS is planned as a modification of the Mechanized Infantry Combat Vehicle (MICV). The concept is for a rapid fire capability of 12 rockets that can be launched singly or in ripples.

COL Barrie P. Masters was selected recently to succeed COL Kenneth Heitzke as GSRS project manager at Redstone Arsenal, AL.

Natick Studies Enzymatic Conversion Reduced Cost Feasibility

Expectations regarding the future of the enzymatic conversion of cellulose waste to many useful products, including glucose and a clean-burning fuel, are being time-adjusted at HQ U.S. Army Natick R&D Command to the hard realities of developing technology for reduced cost production.

Almost two years ago, the potential of the revolutionary process was attracting hundreds of visitors from all over the United States and many foreign nations to the Natick laboratories' experimental pilot plant production. A Congressional committee acclaimed the process as an exciting development.

When the Natick R&D Command was host in 1975 to the first international conference to consider potential applications of the process, and to hear optimistic views expressed by many of the world's noted researchers, it was widely commended as an epochal advance in technology.

About a year later the U.S. Energy Research and Development Administration (ERDA) assumed funding of the development program, including operation of the pilot plant. Again the process was heralded as a "major step forward" in the search for alternate energy sources.

Initial enthusiasm has been tempered somewhat. Natick R&D Command scientists and engineers who collaborated in developing the enzymatic process and the experimental pilot plant reported recently that "research has assumed a more quiet but no less progressive pace. . . ."

Now the difficult question is, as it was recognized at the start of the program: Can the process be made economically feasible? Can scientists convert cellulose into glucose and its host of food, fuel and chemical by-products at a price that is acceptable on a commercial scale?

Natick scientists say there is no easy answer. Hydrolysis of cellulose to glucose is a complex process dependent on many variables, each of which significantly affects the total cost. In the year that has passed since the signing of the ERDA agreement, Natick researchers have reported progress in the long and slow task of investigating, evaluating and optimizing each of the variables upon which successful commercial application of the process depends.

The first step is fermentation of enzyme from the mutant fungus *Trichoderma viride*. The enzyme is the agent that breaks down the cellulose in waste materials and makes it into glucose. Beginning in 1975, scientists turned their attention to producing a higher concentration of enzyme, since this is the critical factor in achieving payoff production.

Extensive experimentation has proved that careful control of nutrients, temperature and fermentation can achieve a 6-fold increase in enzyme activity and a 5-fold increase in the amount of enzyme produced per liter per hour. This lowers the cost of the enzyme, which in turn lowers the cost of producing glucose sugar, a clean-burning ethanol fuel, and numerous other short-supply chemicals.

A second important factor that influences the economics of the process is that most cellulosic waste must be pretreated in order to become susceptible to enzymatic breakdown. Until about a year ago, Natick pretreated waste by ball milling it into fine granules. Ball milling, however, is not only time-consuming (requiring 24 hours) but is also energy consuming and expensive.

Scientists have accordingly, as an alternative, tried hydropulping waste to form a wet sludge. Hydropulping costs less than ball milling, but it yields a low concentration of cellulose to water. For this reason, it too has limitations.

To resolve the pretreatment problem, the search has extended to other physical or chemical pretreatments or combinations of both. Scientists are confident they have now found a better technique in 2-roll milling, used for years in the rubber industry to form raw rubber into sheets. Two rolls rotate toward each other while tearing, grinding and compressing the material fed into them.

This technique does an "excellent job" of shredding waste and breaking the molecular chain so that the enzyme can act upon the cellulose; it also takes far less time than ball milling. The same amount of material that can be ball milled in 24 hours can be 2-roll milled in a mere six minutes!

Natick has successfully 2-roll milled several different types of waste, including pure cellulose pulp, newspaper, sugar cane stalks, waste currency, cotton, sawdust and even food stamps!

Moreover, this pretreatment is also workable on a large scale, using production-size equipment. Researchers are now gathering electrical power data to determine operational cost relative to using this equipment.

Paper mill waste is termed an ideal substance for conversion to glucose sugar — readily available, cheap and needs no pretreatment before introduction into the process. Usually landfilled by companies that must pay for its disposal, it could instead become the source for a number of payoff products.

With this in mind, extensive work has been done on converting paper mill waste in the Natick prepilot plant. The next step is to build a larger pilot plant close to the supply sources. A probable site could be the northwest states where there is a high concentration of paper and pulp companies.

The idea is still in the early planning stages and a great deal more engineering, design and economic data must be collected and evaluated before any plans are finalized. Nevertheless, industry has expressed considerable interest in possible construction of such a plant. It is only with actual full-scale pilot operations that all the questions of cost and feasibility can be answered.

Natick R&D Command recent progress has been made on the cellulose to glucose program, but is not as visible or dramatic as the highly acclaimed early successes. Emphasized by the development team is that the slower pace does not lessen the potential of the program — a potential that grows stronger as it becomes more apparent that the days of cheap energy are probably gone forever.

CUPOLA for the first Roland surface-to-air missile system is inspected by BG Frank P. Ragano, U.S. Army Roland Project manager, at Boeing Aerospace Co. facilities in Seattle, WA. As part of the self-contained module that comprises the Roland fire unit, the cupola provides mounting for the search and track radar antennas, optical sight and launch arms. Boeing is principal subcontractor to and joint licensee with Hughes Aircraft Co. for the U.S. Roland system. The weapon was developed by Euromissile, a joint venture of Messerschmitt-Boelkow-Blohm of West Germany, and France's Aerospatiale. Deliveries will begin this fall.

Black Brant Rocket Photographs Coma Galaxy X-Ray Emissions

X-ray emissions from clusters of galaxies 300 million light years away from the earth were photographed June 8 from White Sands (NM) Missile Range by instruments aboard a Nike missile-boosted Black Brant atmospheric research rocket.

The U.S. Navy experiment carried an advanced imaging X-ray telescope and detector to an altitude of nearly 130 miles to view X-ray emissions from the Coma clusters of galaxies. Relayed to ground instruments on the range, the images were recorded for future study.

Paul Gorenstein of the Center of Astrophysics at Cambridge, MA, developer of the imaging equipment, said the purpose is fourfold:

To find individual active members of the cluster of galaxies; to detect hot gases which might lie between the galaxies; to determine the distribution of mass in the cluster; and to test the X-ray imaging equipment for planned use in future satellites and other space vehicles.

Launched by the Naval Ordnance Missile Test Facility's Research Rocket Branch, the Canadian-built Black Brant, in service at WSMR since 1972, was used for the third in the current series of experiments.

The Nike booster was used because of the extra-heavy payload of instruments, weighing more than 1,000 pounds. The 17-inch diameter rocket was specially configured to carry the 22-inch diameter payload.

The experiment was sponsored by the National Aeronautics and Space Administration. Rocket attitude control and telemetry systems as well as the coordination of the mission were the responsibility of the NASA Goddard Space Flight Center.

Astrophysicists from John Hopkins University studied ultraviolet radiation from Quasar 3C 273, believed to be about three billion light years from Planet Earth, during an earlier experiment in the current Black Brant series of atmospheric probes. Observations were made for about 300 seconds of the total flight time of 10 minutes (to and from an altitude of 136 miles).

JHU scientist Prof. Arthur F. Davidsen said 3C 273 is believed to be the brightest quasar discovered to date. Prof. Davidsen was assisted by JHU Prof. William G. Gastie and physics graduate student George G. Hartig. The experiment was accomplished by the U.S. Naval Ordnance Missile Test Facility with NASA funds.

ACT Responds to Innovative Proposals From Industry

ACT is not necessarily an emphatic exhortation in the Office of the Director of Army Research — but as the acronym for the Advanced Concepts Team it is synomous with rapid response to innovative industry proposals related to the materiel acquisition program.

The stated purpose of ACT as it was chartered in 1974 is: "To receive, evaluate and recommend for funding proposed concepts which offer the possibility of high payoff in Army capability and could benefit from special consideration in the initial technical exploitation phases. . . ."

ACT procedures are established to encourage and facilitate transfer of good ideas from industry and other sources to Army programs with minimum delays. The major hindrance to ACT expedited action in some instances to date has been the constraints on funding.

Some notable examples of proposals that have been funded to date include laser beam radar guidance for missiles, instant smoke, and a low-cost fire control systems for tanks.

Other proposals that have been approved by ACT officials are: Periscope Comparison and Evaluation; SADARM Sensor Spin Measurements; Flashlight Radar; 20mm Discarding Sabot Projectile; Multifuel Capability of Military Diesel Engines; Advanced Fuel Injection System; and Internal Bearing Stabilized Sighting Unit.

Among additional proposals recommended for support are: A laser beamrider Shillelagh missile fired from an armored vehicle, an ultra-low sidelobe radar antenna, an optical fiber payout device for RPV (Remotely Piloted Vehicle) control, and a booster stage for turboshaft helicopter engines.

Numerous proposals (concepts) submitted to the ACT do not suggest a clear basis for R&D action; they may be a commercial product or only a suggestion for a research program without a clear objective of an applicable use for a military requirement. About 7 percent of about 550 proposals submitted as of June 1, 1977 had received funding support.

When the proponent of an idea that appears to have particularly high potential application for a priority military requirement is requested to come for a briefing to the Army Research Office — an element of the Office of the Deputy Chief of Staff for Research, Development, and Acquisition, HQ Department of the Army — the odds for funding improve dramatically, about one chance in three.

The Advanced Concept Team which reviews and recommends proposals for funding is headed by Dr. Charles H. Church, assistant director, Technology, on the staff of Director of Army Research Dr. Marvin E. Lasser.

Other members of the team, all on the staff of LTG Howard H. Cooksey, DCSRDA, are: Dr. Henry J. Smith, scientific adviser to the director of Combat Systems; Dr. Robert J. Heaston, scientific adviser to the director of Weapon Systems; Manfred Gale, adviser for Research, Development, and Acquisition Analysis; James E. Spates, assistant director, Laboratory Activities; and Dr. R. Ivan Hershner Jr., assistant director, Research Programs.

Serving on the ACT as the representative of the U.S. Army Materiel Development and Readiness Command is Edward M. Sedlak, the DARCOM focal point for Ground Laser Designators. He is a recent recipient of the Decoration for Exceptional Civilian Service, the Army's highest standard award for a civilian employe.

ACT procedures are relatively simple. Proposed concepts are received from the commercial and technical communities in the form of information briefs, which serve as a basis for judging potential military suitability. Proposals that pass the initial screening then may be further examined through a detailed presentation by the proponent.

When a proposal has been accepted by the ACT, funds are furnished to an appropriate Army laboratory for award of the contract and monitoring of the progress of the effort. In some cases, the idea comes from within a laboratory, in which case in-house funds are used.

Dr. Church said an "unexpected but very valuable payoff" of ACT is the establishment of communications among people with good ideas for the Army and those Army laboratories which can help get them adapted to Army missions.

Through this dialogue, he added, the ACT becomes to some degree a clearing house for new ideas, a role "warmly welcomed by the private sector seeking to do business with the Army."

Members of the ACT believe that as long as innovative concepts are presented in proposals, and they can maintain a streamlined quick-reaction style of operation, the future is "bright for maintaining a selective idea-to-hardware conversion process which supplements the R&D management cycle."

For further guidance on submissions of proposals or an appointment, prospective proponents are invited to contact: ODCSRDA, HQDA (DAMA-ZE), Washington, DC 20310, ATTN: Dr. Charles H. Church (telephone AC 202 695-3718).

WSMR Tests Experimental Photovoltaic Energy Source

Direct conversion of sun power into electric power from a photovoltaic source is being tested in two experiments at White Sands Missile Range, NM, as part of the U.S. Army Mobility Equipment Research and Development Command's solar energy development program.

Passing observers at one site might little suspect that a nondescript 2½-ton Army truck, shaded by what at first glance looks like an overgrown ping pong table, conceivably could be one of the mobile answers to the range's specialized energy sources in future years.

Designated "C" Station in the test program, the truck carries 2,592 photovoltaic cells, along with 16 six-volt batteries and assorted equipment. Capable of producing 1.5 kilowatts of power at 120 volts and 60 Hertz with an inverter, the experimental unit is supplying power to operate the military police, post taxi and range recovery radio sets.

Placed in operation Apr. 4, 1977, "C" Station has constantly supplied sufficient power for its current experimental applications, researchers report, even on days when the sky was cloudy or overcast. The second test unit is known as the Small Missile Range System and it supplies power for a part of the drone Formation Control System.

Both of the units being tested convert energy from the sun into electricity without intermediate conversion to heat, explains Stan McCallick, chief of Special Project Engineering for the U.S. Army Communications Command Agency at WSMR. He believes photovoltaic sources offer possibilities of providing power needed for special operations at the range.

McCallick says the experimental systems pose a problem of cost-reduction improvements, to make them "economically feasible," but thinks they may meet requirements for power on remote sites such as mountain peaks where delivery of fuel to generators is costly.

"Research and development equipment and especially prototype gear is always expensive," he commented, "but once it is tested and accepted the costs come down with mass production."

McCallick noted the cells are able to store enough energy during the day to run the radio nets throughout the night without any hitches and on cloudy days the current has remained constant. Small amounts of dirt and dust collected on the solar cells have not hampered energy output.

"Rainfall, wind direction and strength, and even dust storms are hard to predict here in New Mexico," McCallick said. "But we do know we're going to have sunshine almost every day. When the economics of this solar system are resolved, I'm sure there will be a home for it on this range."

Test Reports Show Favorable Response to New Personal Armor

Preliminary reports on about eight months of rugged environmental testing in Alaska of the improved personal armor system for ground troops and three candidate prototypes of improved helmets indicate favorable response.

The U.S. Army Cold Regions Test Center at Fort Greely has been involved in testing of these items since last October, and as of early June had logged more than 4,000 hours of wearing the Kevlar improved armor vest.

While most of the Continental U.S. was experiencing one of the coldest winters on record, the weather in Alaska was unusually warm. This fact somewhat hindered test operations, but participants were on call 24 hours a day. Whenever temperature dropped to required test levels, they went into action. An early spring prevented one scheduled tactical exercise.

While alternating wear of test and standard body armor, they negotiated performance courses, skied and snowshoed. They also fired the M60 machinegun, howitzers, mortars, M16 rifle, M203 grenade launcher, M72 light antitank weapon and 45-caliber pistol.

Other test facilities included airborne assaults and simulated tactical exercises in airmobile and mechanized operations. Tracked vehicle drivers wore the test and standard vests while working on construction, and extensive recording of test data was accomplished.

Basically, tests in Alaska were designed to evaluate compatibility of the new armor and helmet with the cold weather uniform and equipment at platoon level in comparison with the standard armor and helmet.

Temporary duty soldiers from the 172d Infantry Brigade in Alaska and the 4th Battalion, 31st Infantry (Mechanized) participated in the test program. All of them reportedly preferred the new armor and helmet.

Natick Reports on 1976 Food Science Laboratory Research

Food Sciences Laboratory (FSL) research for Calendar Year 1976 is reported through 98 technical abstracts compiled in the annual report of the U.S. Army Natick (MA) Research and Development Command (NARADCOM).

FSL is concerned primarily with sciences recognized as basic to the solution of food processing and preservation, and the acceptability of food related to military food systems. The report contains 68 abstracts on Research in Food Sciences, 22 on Research in Pollution Abatement, 5 on Military Subsistence Systems, a Chemical Hazard Information System and a Protective Clothing System and 4 on Food Services Processing and Systems.

Research in Food Sciences abstracts summarize tasks in microbiology and nutrition; analytical and food chemistry; human factors, field studies, food habits and methodology; taste, olfaction, appetite and acceptance. Among tasks in these areas and the investigators are:

Factors Governing the Formation of Microbial Toxins in Foods, William M. Spira, CPT Terrance Brown, Zalmon Pober and Dr. Gerald Silverman; *Radiation Resistant Asporogenuous Bacteria in Frozen Pork and Chicken*, R.B. Maxcy (University of Nebraska), Dr. Durwood B. Rowley and Abe Anellis; *DNA Damage in Bacterial Spores and Cells,* R.C. Richmond.

The Availability of Iron in Foods, D. Tollenaar, CPT Kirk Weber, Bonita Atwood, Miriam H. Thomas, John J. McMullen, K. Ananth Narayan and Dr. William K. Calhoun (deceased); *Computer System for Analytical Chemistry Laboratories,* Dr. Donald H. Robertson, Richard A. Graham and Dr. Charles Merritt Jr.; *Objective Methods for Determination of Food Quality,* Walter G. Yeomans, Jerry K. Jarboe.

Detection of Soy Protein in Food Products, Leo G. Holmes; *Identification of Flavor Producing Constituents in Meat,* David M. Alabran; *Synthesis of New Antioxidants,* William L. Porter; *Natural Antioxidants,* Solomon J. Bishov; *Food Compression and Texture Measurements,* Ronald A. Segars and Dr. John G. Kapsalis.

Human Factors Consultation in Equipment Design, L. E. Symington; *Problems of Food Choice in a Cash/A La Carte Dining System,* CPT James R. Siebold, Nancy Cobean, Connie Stepp, Peter Priori, T. L. Nichols and Day Waterman; *Taste Profiles from Single Human Taste Papillae,* Dr. James T. Kuznicki.

Olfaction and Taste, Margaret Teghtsoonian and Deborah Hunt; *Studies of Magnitude Estimation as a Method of Assessing Food Size Perception,* Dr. Emil E. Becker, Barbara Edelman, Harry Jacobs, Dr. Herbert Meiselman and Dr. Howard H. Moskowitz; *Effect of Intrameal Food Accessibility in Intake,* Richard Moon.

Research in Pollution Abatement abstracts cover pretreatment of cellulosic materials, pilot-scale production of cellulase enzymes, industrial waste treatment research, pilot-scale hydrolysis, enzyme technology, water pollution process development, prevention of microbial deterioration of materials by fungi, solid-waste reduction, military subsistance systems, chemical hazard information system and protective clothing systems.

Tasks and investigators include: *Two Roll Mill Pretreatment of Cellulosic Materials,* T. H. Tassinari, C. F. Macy, Pamidimukkal Vijayakumar, Martin Foncello and J. C. Loehr; *Pretreatment of Cellulose for Enzymatic Hydrolysis,* F. J. Snyder; *Pilot-Scale. Production of Cellulase Enzymes,* John Nystrom, Peter DiLuca and Robert R. Mortensen.

Industrial Waste Treatment Research, Curtis R. Blodgett; *Process Economics of Enzymatic Conversion of Cellulose to Glucose,* A. L. Allen; *Enzymatic Hydrolysis of Waste Cellulose,* Dr. Mary Mandels, David P. Sternberg, Raymond Andretti, John J. Medeiros, Sheila Dorval, Charles D. Roche, Stephen Meyers, Dr. Martin Peitersen, Frank Bissett, Dr. Elwyn Reese, Pamidimukkal Vijayakumar.

Fluidized Bed Denitrification Process, T. M. Wendt, SP4 Paul Heider, Dr. John H. Cornell and A. M. Kaplan; *Enhanced Transformation of Nitro Compounds by Mutants of Fungi,* Dr. Neil McCormick; *Reduction of Packaging Materials,* Charles F. Macy; *Protection Capability of U.S. Army's Protective Outfit Toxicological Microclimate Controlled (POTMC) Against Hazards Posed by 900 Hazardous Chemicals,* F. J. Snyder, Charles F. Macy, Leo A. Spano and Dr. V. D. Iacone.

Four abstracts in Appendix A summarize research in food services, namely: *Sensory Evaluation Services,* R. A. Kluter, D. E. Sherman, B. L. Bell and R. S. Lund Jr.; *Analytical Food Chemistry Testing,* Otto J. Stark, Jerry Jarboe, Stephen Swift, Lloyd Cox, Margaret Robertson, Esther Garber, Paul M. Grady; *Nutrition Service Work,* M. H. Thomas, B. M. Atwood, J. J. McMullen and W. K. Calhoun; *Food Science (Microbiological) Support of Field Feeding Systems*, Dr. Gerald Silverman, D. T. Munsey and D. B. Rowley.

Readers requiring more information may address inquiries to the investigators named with the abstracts or to Dr. S. David Bailey, director of the Food Sciences Laboratory, U.S. Army Natick Research and Development Command, Natick, MA 01760.

Test Generator Development May Lead to Safer Jet Aircraft

Development of a second-generation testing device expected to lead to safer jet aircraft through a better understanding of jet-engine internal flow processes is progressing at Battelle's Columbus (OH) Laboratories under an agreement with NASA's Lewis Research Center, Cleveland, OH.

Researchers in the $443,000, 18-month program are conducting analytical and conceptual design studies and developing a prototype of a planar pressure-pulse generator. Pressure pulses to an engine inlet duct are controlled so the effects of flight-maneuver conditions on the engine can be predicted.

William H. Wilkinson, head of the Battelle study team, said the generator will help aircraft designers and engineers determine the response of engines to duct pressure pulsations of different strengths and frequencies.

The Battelle-developed generator is expected to extend dramatically the testing program for jet engines. Wilkinson explained that the generator will test at a broader range of frequencies, at higher amplitudes, and with less interference from unwanted harmonics than is now possible.

Design of the first prototype generator conceived and developed three years ago is being upgraded for use by an aircraft engine manufacturer in testing the axial compressor of a 45-inch diameter jet engine. Wilkinson said it will be adaptable to engines of different sizes and will be "capable of exciting selected portions of an engine's inlet-flow area."

The redesigned generator will extend capabilities of the mechanical drive system of the original version so that frequencies as high as 3,000 hertz and as low as 10 hertz can be generated. Improvements also will add to the generator's operating flexbility as a research tool.

ABMDC Initiates 2-Phase Homing Overlay Technical Experiment

BMD Program Manager BG John G. Jones says the Homing Overlay Experiment (HOE) is aimed at resolving key technical issues that would be involved in developing interceptor missiles to operate above the atmosphere as additions to defensive systems at lower altitudes.

Initiation of a 2-phase competitive procurement for a major new experiment in its Systems Technology Program is announced by the Army's Ballistic Missile Defense Command.

A single contractor will be selected for Phase II development of the HOE interceptor. This will integrate the flight experiment with the Systems Technology radar and data processing test facility already in operation at Kwajalein Missile Range in the Pacific.

Another HOE objective is to explore ways to reduce the development and deployment lead times this type of system normally requires.

Director C.D. Richardson of BMDSCOM's Systems Technology Project Office has selected William C. Loomis to direct a special HOE task force. Contractors selected in each phase will work with the McDonnell Douglas Astronautics Co., engineering and design integration contractor for the Systems Technology Program.

The STP will investigate and evaluate potential BMD systems adaptable to defending a variety of national high-value targets. The program is focused on solutions to key technical issues involved in developing such systems, with emphasis on reducing deployment lead time.

Airborne Target Acquisition and Fire Control Systems (ATAFCS), containing the laser designator, mounted in the nose of a Cobra AH-1G helicopter. The laser designator is used in conjunction with the Copperhead Cannon-Launched Guided Projectile (CLGP), tested recently at White Sands Missile Range (WSMR), NM. The Copperhead scored a direct hit on a moving target tank.

Ingenuity Produces Incredible Result. . .

101st Airborne Division 'Volunteers' Trim AN-TRQ 32

How is your credibility vulnerability today? High! Then read on.

How come 101st Airborne Division (Air Assault) forces are voluntarily getting into the fringe area of the U.S. Army Materiel Development and Readiness Command's high- priority Product Improvement Program (PIP) as users of the AN-TRQ 32? — not only getting into the action but in a large-scale way, successfully!

The answer comes from the Public Affairs Office at Fort Campbell, KY, which recently reported that the weight of this short-range direction finder has been reduced by *almost 10,000 pounds.*

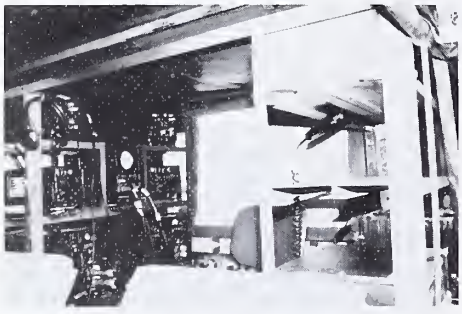
That report appears at least somewhat stupendous — until it is dwarfed by the claim that the feat was accomplished in six consecutive weekends of highly intensive effort by LT Robert E. Seetin and SGT Roger Krueger of the 265th Countermeasures Electronic Warfare (CEW) Company.

When they went to work on the bulky gamma goat vehicle-mounted TRQ 32, their objective was to make it "much lighter, more mobile and more effective. . . more adaptable to the air assault concept of operations."

The standard TRQ 32 and their product-improved TRQ 101 are both ground-based direction finders which use the same antennae and mount pedestals to pinpoint enemy communication transmissions. That's where most similarities end, they now claim.

The TRQ 32 consists of three major components — the M561 gamma goat, the TRQ 32 direction finding equipment and the unit's power source, the PU 620 generator set. Two external Chinook aircraft loads were required to airlift the entire unit from one location to another.

Once the TRQ 32 equipment was on station, it would take a team of six personnel approximately 30 minutes to make the unit operational, since the system cannot receive transmissions until the generator is trenched and grounded.



265th CEW Company members reduced AN-TRQ 32 weight by almost 10,000 pounds. Remodeled AN-TRQ 101 interior was designed with angle iron and metal shelving.

Additionally, the generator, when operational, the PIP volunteers contend, emits enough noise to enable enemy ground forces in the vicinity to pinpoint the direction finding position. Moreover, due to its bulk in the event of enemy ground contact, evacuation of the friendly position without leaving behind at least the generator is unlikely.

Since the M561 gamma goat can accomodate only a driver and one passenger, it was necessary to dispatch another vehicle to transport the remainder of the team members to the direction finding site. During these relocations, continuous reception of enemy transmissions was disrupted.

Armed only with their own ingenious ideas and property disposal supplies, Seetin and Krueger began streaming their TRQ 101. One of their major concerns was choosing a transport vehicle which was light and mobile enough to respond to a fluid tactical situation. They chose the M151A2 quarter-ton truck.

They cut lengths of angle iron and molded shelving to house the direction-finding components. They were able to omit the generator set completely by converting the power source of the TRQ 32 to the M151A2's 24-volt battery system. This change not only reduced the weight and noise level of the former power source; it also allows for in-transit reception of enemy transmissions.

In situations where the TRQ 101 must be displaced at a great distance in a relatively short time, the unit can be moved by air as a one-lift, internally loaded Chinook cargo. All that is required is driving the M151A2 up the Chinook ramp and securing the unit inside the aircraft.

Set-up time for the new TRQ 101 is approximately 10 minutes for a crew of four, a substantial (about 2/3) reduction from that required for the TRQ 32 system. Again, there is no disruption of reception during this set-up.

The TRQ 101 system is capable of transporting a crew of four internally — eliminating the need to dispatch another vehicle for troop- hauling purposes. Another advantage of the TRQ 101 configuration is its outward physical appearance. The absence of the cumbersome generator and gamma goat make the TRQ 101 appear to be nothing more than average jeep to enemy observers.

In addition, the TRQ 101 is equipped with a VRC 46 vehicular radio with KY-8 secure communications for radio conversation between direction finder teams and higher headquarters.

Whereas the TRQ 32 system kept direction finding a somewhat static operation, the TRQ 101 lends a roving mobility to the activity. This quick displacement capability enables teams to increase their number of line bearings (azimuths), in tracing enemy transmitting antennae and over a greater distance.

Although both models of the TRQ used by the 265th CEW Company can be used to pinpoint communication transmissions from as far as an optimum of 15 kilometers, the advantages of the TRQ 101 are significant.

Division G-2 LTC John A. Pattison said, at the completion of TRQ 101 testing at Fort Campbell, that he plans to recommend to XVIII Airborne Corps that similar prototypes of the 101 be adapted for all light infantry divisions.

"I asked our CEW people to take a hard look at their equipment and develop adaptations with the mobility and flexability compatible to air assault tactics," said Pattison. "The CEW community at Fort Campbell has definitely done that with a 'plus' in the development of the TRQ 101."

TARADCOM Conducts Durability Tests of Improved TOW System

"Shake, Rattle and Roll," a popular rock music hit of the 1950's, might be descriptively and perfectly attuned to tests of military materiel being conducted at HQ U.S. Tank- Automotive Research and Development Command.

Building 215 houses TARADCOM's Terrain-Simulation System, currently being used for durability testing of the Army's Improved TOW (Tube-launched, Optically-tracked, Wire-guided) missile, recently redesignated the ITV (Improved TOW Vehicle).

The entire system has been mounted on road-simulation equipment consisting principally of hydraulically actuated platforms. They violently shake the vehicle while subjecting it to stresses and strains similar to those in the field.

Motions and vibrations produced may simulate such adverse terrain conditions as gravel, cobblestones and hills. A programed computer controls the road simulator and the vehicle is equipped with special recording devices.

The ITV is basically an M113A1 armored personnel carrier which has been modified to carry a specially prepared armored weapon station and the TOW antitank missile system.

Precisely how well the ITV withstands the intense road shock and shake simulation is determined by shutting down the test equipment six times daily — allowing a gunner to climb into the cupola, operate the weapon, and evaluate it.

ITV Project Manager COL Charles C. Adsit stated: "Our prime objective is to provide armor protection for the TOW as soon as possible. We decided to run simulated tests because test time can be reduced up to 50 percent.

Conventional tests would have required up to four months to complete. However, in the laboratory environment we can put the ITV through the same stresses in only two months."

Delivery of the first 10 TOW vehicles is programed this year under terms of a $7 million low-rate initial production contract.

AN-TRQ 101 Mounted on M151A2

AN-TRQ 32 Mounted on M561 Gama Goat

Nuclear Meter Technique May Reduce Preventive Maintenance Costs

Dual benefits of savings of millions of dollars annually in preventive maintenance costs on roofs and related energy conservation action in buildings occupied by the U.S. Armed Forces are envisioned by use of an Army technique developed initially for the Air Force.

The U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, MS, developed the technique in 1975 for the Strategic Air Command, using a nondestructive portable nuclear moisture meter to survey the condition of roofs at eight SAC bases. Repair of roofs is a multimillion dollar item in yearly budgets of SAC and other U.S. Armed Forces units.

The high cost of roof repair could be reduced substantially if areas of entrapped moisture, causing rapid decay, could be pinpointed to limit repair operations. Frequently the current practice is to replace the entire roof. Use of the moisture meter at the eight SAC bases reportedly resulted in a projected reduction in maintenance costs of at least 40 percent.

Use of a nuclear meter, however, requires two men to survey reported trouble areas. Cost effectiveness would be increased considerably if it were possible to identify more rapidly the suspected problem areas for more detailed investigation with the meter.

WES reported recently that this rapid survey capability has been developed through the use of thermal infrared (IR) sensing systems; areas with entrapped moisture are cooler during the day and warmer at night.

Aerial reconnaissance flights using thermal infrared sensors can record this information photographically. Follow-up detailed surveys with the nuclear meter can verify the locations and extent of entrapped moisture.

Efficiency of these techniques was demonstrated in tests at Dyess Air Force Base, TX, Pease AFB, NH, and Offutt AFB, NB. Only roof areas deteriorated by the presence of moisture now have to be repaired - thus saving the Air Force substantial maintenance costs.

A manual on use of thermal infrared imagery has been prepared for SAC and is being adapted to the preventive roof maintenance program.

Roof survey techniques also are being evaluated by the Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, NH, the Facilities Engineering Support Agency (FESA), Fort Belvoir, VA, and WES, under direction of the Office of the Chief of Engineers. This cooperative effort has emphasized evaluation of both general and detailed on-the-roof survey devices, including hand-held IR viewers.

The Los Alamos Scientific Laboratory (LASL) learned about the WES research effort and contacted Dr. Lewis E. Link, chief of the Environmental Research Branch of the Mobility and Environmental Systems Laboratory. This led to a demonstration in March 1977 of the applicability of airborne infrared for an energy conservation study at LASL in Los Alamos.

Variables were defined for LASL, such as the type of sensor system used, the time of day and year that the imagery should be taken, the altitude for the flights, and other controlling factors. Two USAF RF-4C reconnaissance jets from Bergstrom AFB, TX, made approximately 20 low-level passes over LASL and Los Alamos between 10 and 12 p.m.

A U.S. Army Mohawk reconnaissance aircraft from Fort Huachuca, AZ, acquired additional thermal IR imagery data of the LASL area.

THERMAL INFRARED SENSOR System photograph of rooftops at Dyess AFB, TX. Taken at 10 p.m., the photo indicates areas suspected to have entrapped moisture, by the light spots on the roofs. Symmetrical rows of dots are air vents. The building on the right is riddled with entrapped moisture; one on left has spot in center.

WES Experimental Research Branch chief, Dr. Lewis E. Link (second from left) and Los Alamos Scientific Laboratory and University of New Mexico visitors examine thermal infrared photos. From left, Jim Reid, Chris Haecker, Wynn Daggett (LASL); Mike Inglis (UNM).

The resulting images pinpoint not only unusual heat loss from poorly constructed roofs, and roofs in which heat-releasing moisture has been trapped, but also reveal leaks in underground steam and condensate pipe.

LASL officials visited WES in May to study the photographs. Dr. Link explained how the photos are interpreted to evaluate energy loss. Prior knowledge of certain physical features of the area is necessary to avoid misinterpretation of the photos. Aerial photographs of the area help to curb confusion by defining roads, buildings, water tanks, air vents, etc.

Preliminary analysis shows the technique to be a valuable analytical tool, promoting both energy and monetary savings, when used in conjunction with conventional maintenance management techniques. WES, SAC, and LASL officials anticipate widespread use of infrared technology for energy conservation in the future.

Chris Haecker of LASL and Dr. Link will present a technical summary of the project at the Third Annual Energy Research and Development Administration Energy Conservation Symposium this fall in Oak Ridge, TN.

Army Receives First Improved Chaparral Missile

The first new and improved Chaparral air defense missile to come off its production line was delivered to the Army July 6.

Louis Heilig, vice president and general manager of Ford Aerospace and Communications Corp., presented the missile in a ceremony at Red River Army Depot, Texarkana, TX. The depot does inspection and final assembly of Chaparral missiles for Aeronutronic Ford.

Army Materiel Development and Readiness Command Deputy CG for Materiel Readiness LTG Eugene D'Ambrosio and COL Howard Whittaker, Chaparral/FAAR project manager, Redstone Arsenal, AL, accepted the delivery.

Texas Congressman Sam B. Hall attended the ceremony, during which Heilig praised the government-industry team for its accomplishments and said the partnership "significantly strengthens this country's air defense capabilities."

Congratulating the team for a job well done, and commenting that the delivery represented a milestone in the Army's air defense history, LTG D'Ambrosio noted that the unique Army-Aeronutronic procurement could be a model for future weapon acquisition, saying in part: "This improved missile will keep Chaparral abreast of the air threat for many years to come."

Chaparral is an infrared heat-seeking missile mounted on a tracked vehicle that complements other Army air defense weapons, covering the battlefield above the range of Stinger and Redeye, and below Hawk. The FAAR, used with Chaparral, provides early detection of attacking enemy aircraft and relays information to the antiaircraft sites.

The improved Chaparral features a new guidance section that gives the missile a 360-degree intercept capability, lacking in older missiles. The new missile includes a new fuze developed by Harry Diamond Laboratories and warhead developed by Picatinny Arsenal.

LTG D'Ambrosio presented Heilig and Aeronutronic Ford a tri-service certificate for implementation of a management cost-saving tool known as a Cost Schedule Control System (CS2). The Army CS2 program outlines precisely what is to be done, who does it, when, and how much everything will cost.

Aeronutronic Ford, which previously had been the Army's prime contractor for Chaparral fire units, became system contractor for the complete missile as well under an Army contract awarded in March 1976.

Computer Patterns Help Uniform Designers

Computerized pattern making is proving a "tremendous time-saver for designers" in the U.S. Army Natick Research and Development Command process of producing new uniforms. Designers reportedly have more time to devote to styling as a result.

Termed the only computerized pattern-making operation in the U.S. Armed Forces, as well as one of the few in the clothing industry, the NARADCOM system designs, grades and cuts a full range of sizes.

Moreover, the system is acclaimed as "insuring greater accuracy" in the design process in that the pattern, when established in the computer, can be transmitted to the service procurement office without human error.

The pattern can be recalled from the computer memory bank and flashed to a telescreen for review, including alteration by a digital control.

COMPUTERIZED PATTERN process includes drawing the master pattern that is traced with a digital plotter with assigned grading points. This information is fed into Natick's computerized pattern-maker; the design is checked on the display screen; push-button controls activate the cutting table, which can grade a series of sizes or cut individual patterns; the result appears on the cutting table - a finished pattern with all seams and darts marked.

BRL Aids NBS to Combat Contamination

Responding to a request by the Law Enforcement Standards Laboratory of the National Bureau of Standards for aid in reducing lead contamination at indoor rifle ranges, the Army Ballistics Research Laboratory is engaged in a team effort for corrective action.

Prolonged exposure to lead particles in the ranges can be hazardous to the health of police officers, as determined in recent studies by the National Institute for Occupational Safety and Health, supplemented by studies conducted by state and local agencies and law enforcement units.

BRL researchers have considered ways to improve ventilation at the firing ranges. Findings have established that renovation will be costly; also, that such action would not solve lead contamination.

The extensive BRL study resulted in recent release of a report titled "Reduction of Airborne Lead Contamination in Indoor Firing Ranges using Modified Ammunition." Dr. Arpad A. Juhasz of BRL's Applied Ballistics Branch headed a 5-man team: Roger Bowman, George Samos, Nelson McCall and George Harryman, all with the Propulsion Division.

"We determined," Dr. Juhasz said, "that possible sources of lead contamination are the projectile and the primer (a mixture generally containing lead styphnate), so we set out to reduce or eliminate the lead."

Contamination is most acute at or near the gunner and also at the impact (target) area. The BRL team concluded that soft targets and possibly lead-free projectiles might offer a solution. Accordingly, a decision was made to use commercially available copper-jacketed lead projectiles - thus reducing cutting action in the barrel rifling and preventing "gas wash" at the base of the bullet.

The next phase of the BRL study was to test conventional .38-caliber ammunition versus custom-made bullets having lead-free primers and copper-jacketed lead projectiles. A special police revolver from the National Bureau of Standards was used, along with a means of collecting lead particles for analysis. Electronic devices recorded ballistic data.

Ammunition was provided by Remington Arms Corp. in accordance with BRL specifications and all rounds were hand loaded. An aluminum box with a pistol rest was machined to provide a port for fired bullets and used as a firing chamber. A sequence timer actuated a firing solenoid.

The bullet trap was a 6mm-thick steel plate placed at a 45-degree angle 9.14 meters from the chamber. An aerosol sampling device was placed in front of the bullet trap impact area. The circuit of firing monitors included air sampling pumps and the sequence timer.

Used in the tests were four types of bullets: lead with conventional primer; lead with a lead-free primer; copper-jacketed bullet with a lead-free primer; c-j bullet with a conventional primer.

Results showed that lead contamination expelled from conventional bullets substantially exceeded that from c-j rounds without lead primers (5.6 milligrams per round to 0.013). Another finding was that muzzle velocity for the c-j rounds was somewhat less than for conventional rounds - due to the jackets and the composition of non-conventional primers.

Test personnel increased bullet velocity by raising voltage on the firing actuator (solenoid). Absence of hot particulate matter in the decomposition products, it was found, tended to produce poorer transfer of energy, thereby further reducing bullet velocity.

They think it should be possible to reduce aerosol lead contamination from hand guns by changing the ammunition, without sacrificing ballistic performance.

Law enforcement agencies countrywide have indicated they are pleased with the BRL report, Dr. Juhasz said, and the results are a good example of effective joint effort to solve a problem of national concern. "BRL management likes to help outside agencies if it is helpful to all involved."

Army/Marine Corps MOA Calls for Artillery BCS

Development of a field artillery Battery Computer System (BCS) is provided for in a Memorandum of Agreement that has been signed by the Army and Marine Corps, requiring a low-cost, reliable replacement for the Field Artillery Digital Automatic Computer (FADAC) and the TACFIRE Battery Display Unit. Award of a production contract is scheduled for early 1979, requiring delivery of models in mid-1981. The prime contractor is the Norden Division of United Technologies Corp., with Marconi Ltd. of England as a major subcontractor.

The Army-Marine Corps agreement calls for development of common hardware for both services with modifications limited to the maximum extent, and only by mutual agreement. Software development for each service may reflect the respective doctrine of each service.

Specifications require that the system will perform basic cannon ballistics and Lance missile calculations, and will provide digital interfaces for use with tactical data systems and for the transmission of data to individual artillery weapons.

Project Manager BG William J. Hilsman said the Army Tactical Data Systems (ARTADS) calls for utilization of existing technology to fill the proven requirement for fire direction with a low-cost computer.

Designed to make maximum use of recent technological advances, the system is intended to increase reliability and maintainability of the Battery Computer System while maintaining a level of performance compatible with stated user requirements.

3 Months Inflate Army Materiel Cost $450 Million

Cost increases of about $450 million for major hardware items in U.S. Army equipment acquisition programs during the first three months of 1977 are reported in recently released Pentagon budgetary estimates.

Increases of $2.2 billion and $706 million in the respective hardware programs of the U.S. Air Force and Navy also are reported. Actual and projected escalation accounted for 67 percent ($2.3 billion) of the total $3.3 billion increase for the three services.

A major portion of the Army increase resulted from cost hikes in the YAH-64 advanced attack helicopter program, the Mechanized Infantry Combat Vehicle (MICV), and the XM1 Main Battle Tank.

Other reported increases are for the Patriot air defense system fire sections, the Utility Tactical Transport Aircraft System (UTTAS), Roland Missile fire units, Copperhead guided artillery rounds, Hellfire missile, and the M-198 towed medium howitzer. These increases are slightly offset by a $115 million combined cut in expenditures for the Improved Hawk missile and nonnuclear Lance missile procurement programs.

Air Force and Navy increases are attributed largely to the B-1 bomber ($2 billion), F-15 fighter ($387 million), SSN-688 nuclear submarine ($495 million), and the FFG-7 guided missile frigate ($164 million).

TECOM Updating Test Resource Management System Capabilities

Modernization of its Test Resource Management System (TRMS), operational since July 1969, to increase its potential to "unlimited" for rapid output of information from master files, is announced by the U.S. Army Test and Evaluation Command, Aberdeen Proving Ground, MD.

TECOM manages a multimillion dollar network of nine test and evaluation facilities, distributed from Maryland to Arizona and from Alaska to the Panama Canal Zone. Included are a solar furnace, a variety of stressful road surfaces, instrumented firing ranges, electromagnetic arrays and environmental centers.

TRMS is a computerized data base providing test managers with comprehensive and accurate information on forecast workload, associated direct labor testing manhour and dollar resources required, the status of resource availability and expenditures, and test workload performance.

The direct labor testing manhour is the basic TECOM workload measurement. Direct labor manhours are those associated with development and coordination of test plans; the conduct and/or participation in tests; the analysis, evaluation and reporting of test results; and the development of test instrumentation and methodology.

Implemented in July 1969, TRMS (pronounced Trims) is divided into two master files - a Command Schedule, providing a 5-year forecast of projected workload, and an Activity File, containing individual records for which test directives have been issued.

The Command Schedule identifies hardware that will require testing in the future. It allows the headquarters materiel testing directorates to plan for the tests, and for TECOM to develop test instrumentation and methodology in advance when new technology is involved.

Information areas covered by the Active File include: basic test identification data; direct labor manhour estimates and schedules; test milestone or test event data; funding status data and test status narrative.

TRMS provides data necessary for Operations elements to balance TECOM's test workload requirements with its capabilities. To this end, TRMS provides data on individual test status, produces and maintains workload projections, and provides summary reports for analysis and evaluation of over-all test mission performance.

Other uses of TRMS data by Operations elements include: resolution of workload and day-to-day or week-to-week operational problems of TECOM's installations, activities and test proponents; validation of test resource requirements; and use as sources of information for responses to higher headquarters and test proponents for mission-related information.

TECOM headquarters' Test Operations and Policy Office (TOPO) is responsible for functional management and operation of TRMS. David Fletcher, Operations Division chief, says TRMS gives managers at headquarters information necessary for evaluation of a number of management indicators keyed to test mission performance - e.g., how much workload was accomplished against a preconstructed plan, what test slippages occurred.

TOPO controls the input to the Command Schedule File which is based on information supplied by test proponents and is updated continually. Input to Activity Files flows in both directions, between TECOM headquarters and its installation/activities.

Output is in the form of individual test records and resource summaries which are distributed to test proponents, installations, activities, headquarters staff elements, and, upon request, to higher headquarters.

"This information is used in determining and evaluating alternatives when addressing budget and manpower needs," says Fletcher. "Having a centralized data source also makes it much easier to respond to inquiries from DARCOM and DA on our test mission performance and resource requirements. System output reports are ultimately used to defend our resource requirements and funding request.

"The inability of commanders to extract data to meet their respective individual management needs is the major problem with TRMS. We would have to write a myriad of computer programs to individualize systems' output," Fletcher says. "We cannot now custom-tailor output for individual users; when we have a modern data base management system, we will do that both efficiently and cost effectively."

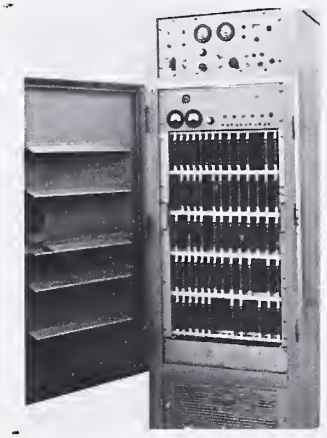
U.S., NATO Test High-Speed Army Digital Tropo Modem

Upgrading of existing systems to provide high-speed digital communications is linked to anticipated successful completion this summer of joint testing by the United States and NATO (North Atlantic Treaty Organization) of the U.S. Army Digital Tropo Modem.

Programed as a major element in conversion of troposcatter links from analog to digital operation, the MD-918/GRC was developed under the U.S. Army Communications Systems Agency/Project Manager DCS (Army), Fort Monmouth, NJ. Technical direction was provided by the Communications/Automatic Data Processing Laboratory, U.S. Army Electronics Command.

Troposcatter is the re-radiation, or scattering, back to ground of radio energy from the tropospheric layer of the Earth's atmosphere. The goal of converting to digital operation is explained by the fact that current analog links from troposcatter are subject to periods of degraded transmission.

Contract effort on the conversion technology was started in 1973 with an award to GTE Sylvania and Signitron Inc. Testing was started in 1975 and eight engineering development models were built and tested.



MD-918/GRC Digital Modem

Conversion of troposcatter links from analog to digital operation involves the MD-918/GRC, which provides better performance over existing troscatter paths.

Termed a modulator-demodulator, the MD/918/GRC can transmit 192 digitized voice channels up to 150 nautical miles - or 96 channels over tropospheric links up to 250 nautical miles - an 8-fold increase over the 24-channel capability of present equipment.

Insofar as is practicable, the program of upgrading the modem to meet Defense Communications Systems performance requirements will be accomplished by using currently available components - thus avoiding costly, time-consuming development. For example, the choice of transmission rates (1.544 Mb/s to 12.56 Mb/s) was influenced by available multiplexer testing equipment.

Defense Communications Systems requirements also include: Integrating a quality monitor to assess performance of the modem on an on-line basis; have a 64 Kb/s digital service channel for the engineering channel; design a quadruple-diversity 4 PSK modulator/demodulator; adapt electrically to existing DCS troposcatter equipment; adapt a decision-feedback equalizer for fading channel application.

Factory, field and simulated performance tests to date are reported to "agree quite favorably' with theoretical performance predictions. Winter field tests demonstrated ability of the MD-918/GRC to operate successfully over an actual troposcatter link.

Final phase field testing is ongoing in Germany, Italy and at NATO troposcatter links. MD-918/GRC tests will be compared with an Air Force piece of equipment described as similar in nature. Achievements in the program are being commended as advancing state-of-the-art in digital troposcatter communications.

Navy Announces 22-Month Contract For Army Self-Paced Training Kits

Development and production of self-paced training programs in kit format for 11 Army service schools will be provided under a 22-month contract awarded by the Naval Training Equipment Center for the Army Project Manager for Training Devices.

Mass production of the kits, intended for use with the Army's individual training program called Training Extension Course, will be carried out by Applied Devices Corp. for worldwide distribution by the Army.

Schools programed to receive the kits are: Military Police, Fort McClellan, AL; Infantry, Fort Benning, GA; Field Artillery, Fort Sill, OK; Intelligence, Fort Huachuca, AZ; Signal, Fort Gordon, GA; Aviation, Fort Rucker, AL; Intelligence, Fort Devens, MA; Academy of Health Sciences, Fort Sam Houston, TX; Institute of Administration, Fort Benjamin Harrison, IN; Armor, Fort Knox, KY; and Air Defense, Fort Bliss, KY.

Please pardon, dear readers, the lateness of this special edition of the *Army Research and Development Newsmagazine* to give feature coverage to the Atlanta IV Executive Seminar - held 10 days after our deadline date for submission of material to the printer.

What started out to be a normal May-June edition (somewhat late!) ran afoul of unprecedented coordination and clearance requirements extending over a 7-week period. Normal summer vacations for two staff members (50 percent of total) compounded our problems. Thus this became a May-July edition. Our next issue will be August-September.

National JSHS Program Supported by Army, Academia, Industry

Dominant in mainstream thinking of inflation-troubled Americans, particularly executive decision-makers, is "the bottom line," connoting Return on Investment of money, time, effort.

This practical consideration links naturally to the 15th anniversary of the National Junior Science and Humanities Program conducted by the U.S. Army Research Office, located in Research Triangle Park, NC.

Impressive evidence of the esteem in which the program is regarded by many of the nation's prominent leaders was provided by the distinguished guest speakers, chairmen of eight concurrent discussion groups and directors of 41 regional symposia at the 15th National JSHS in May.

Staged at the United States Military Academy, West Point, NY, which has been host to the National JSHS in alternate years since its inception, the symposium was strongly supported by the USMA faculty and the cadet corps — including a full-dress parade of the corps, visits to the laboratories and classrooms, and an organ concert in the chapel.

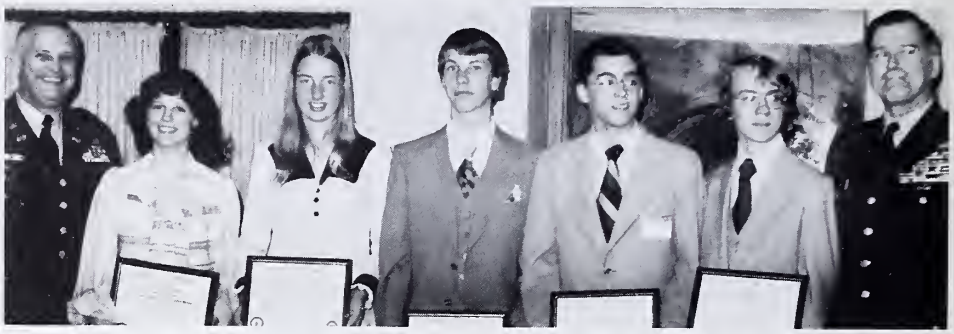
Five students representative of each of the regional JSHS — in which about 7,000 science students throughout the United States and Department of Defense Dependents' Schools in Europe participated — attended the 15th National JSHS. Their selection was based on the excellence of their basic research projects.

One student from each of the regional competitions was accorded the honor of presenting a technical report on research results. Five of the presenters were selected by a panel of 17 senior scientist judges, representative of the major scientific disciplines, to attend the International Youth Science Fortnight in London, England, July 26-Aug. 10.

The *London trip winners* are: *Nicolla Van der Hayden*, 17, a junior at Murray (UT) High School, whose seven years in junior science fairs have been rewarded by a continuing progression of honors; *Lori Ellen Rhodes*, 18, East Noble H.S., Kendalville, IN, whose interest in science was sparked in the third grade; *David Edlund*, 18, Hiram Johnson H.S., Sacramento, CA; *John A. Hayden*, 17, Central H.S., La-Crosse, WI; and *Philip King*, 17, Christian Brothers Academy, Lincroft, NJ.

(Descriptions of their research projects, biographical information, and planned objectives in science careers are given later in this article.)

FAMED NUCLEAR SCIENTIST Dr. Edward Teller generated the idea that led to establishment of the U.S. Army Junior Science and Humanities Program. He was the keynote speaker at the first National JSHS, and returned to give the featured address at the 13th NJSHS at the U.S. Military Academy.



LONDON TRIP winners Lori Ellen Rhodes, Nicolla Van der Hayden, David Edlund, Philip King and John A. Hayden, flanked by U.S. Army Research Office Commander COL Anthony P. Simkus (left), and DARCOM director of Battlefield Systems Integration MG Ira A. Hunt Jr.

All through the years of growth of the National JSHS Program, Dr. Teller has indicated his continuing interest. His 1975 address, "Energy: A Program For Today," was about a 90-minute long (including questions and answers) presentation. His eager audience carried away an unforgettable picture of the aging scientist, too tired to stand at the podium, taking center stage and sitting at the edge to answer questions.

Internationally renowned scientists, engineers and educators have contributed as guest speakers to the success of each NJSHS — constituting what is now a long procession of brilliant leaders who have taken time to evidence their endorsement of the program. They have made a challenging investment in faith in the future of the many exceptionally gifted young science students who have participated. To them, there can be no controversy regarding potential Return on Investment (ROI).

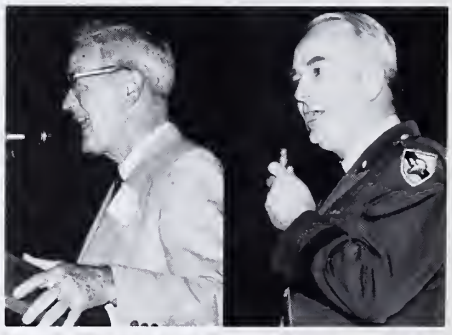
The 15th Anniversary of the NJSHS continued this proud tradition, with five guest speakers whose stimulating challenge to their young listeners was acknowledged with one standing ovation after another. Each was surrounded later in the USMA historic Thayer Hall and at the Thayer Hotel by students eager to continue questions and answers discussion.

USMA Dean of the Academic Board BG Frederick Smith, formerly on the staff of the Army Chief of R&D, welcomed the conferees at the opening session in Thayer Hall. His remarks were made on behalf of USMA Superintendent LTG Sidney B. Berry, since reassigned as commander of V Corps, U.S. Army Europe.

BG Smith spoke briefly on the role of science in national economic welfare, structuring the national defense posture, aspects of American culture, and "our way of life." He closed with a tribute to scientists and engineers who will help to preserve that culture "with a knowledgeable, understanding, sympathetic contribution to the humanities aspects."

USMA Assistant Dean for Academic Research COL William B. Streett followed with the introductory guest speaker address on "Properties of Gases at High Pressure — Implications for Planetary Physics." This area of investigation, he explained, is of "enormous interest" to U.S. and Soviet Union researchers, concerned with spatial dynamics of rotating forces at extremely high speeds and pressures.

Prof. Streett said this field of scientific study is considered of potentially tremendous significance, in that it involves factors impossible or exceedingly difficult to simulate in laboratory experiments. He termed it a "fascinating, exciting field open for young minds with fresh ideas." He intrigued his audience with numerous photographs of Jupiter, Saturn and other



USMA Dean of Academic Board BG Frederick Smith and Dr. Marcus Hobbs, former dean of Duke University and chairman of the JSHS Advisory Committee.

INVITED SPEAKERS (l. to r.) Dr. Maynard M. Miller, dean of the College of Mines and chief of the Idaho Bureau of Mines and Geology; Dr. Don Lind, NASA astronaut-scientist; Dr. David P. Young, chairman, Department of Chemistry at Maryville (TN) College; Dr. Ernst Soudek, associate professor, Division of Humanities, School of Engineering and Applied Science, University of Virginia; COL William B. Streett, USMA assistant dean for Academic Research.

distant planets showing the reactions of gaseous forces.

Prof. Streett has established a reputation as one of the world's highly knowledgeable scientists in this area of investigation, and has authored or coauthored 45 publications in professional journals. Graduated from the USMA with a BS degree in 1955, he received his MS (1960) and PhD (1963) in mechanical engineering from the University of Michigan.

Founder of the USMA Science Research Laboratory in 1969 in a handsome new academic building, and continuous director since then, Prof. Streett served as assistant chief of the Operations Division at the U.S. Army's Watervliet (NY) Arsenal in 1967 — after returning from study as a NATO Research Fellow in chemistry at Oxford University in England.

During 1974-75, he was a Guggenheim Fellow at Oxford University. Five times since 1971, he has been an invited lecturer at the Gordon Research Conferences.

Dr. Maynard Miller's address on "The Resource Crisis and Politics" was his second NJSHS appearance as a featured speaker. He discussed the environmental crisis at the 1971 symposium in a presentation that was long and vigorously applauded — as was his 1977 challenge to "think our way out" of the current dilemmas of the energy shortage and other dwindling resources.

Introduced by Army Research Office Commander COL Anthony P. Simkus, Dr. Miller discussed at length the ecology of cataclysm, the evolution of the changes from periods of order into disorder (chaos) involving great complexities (crises), and the gradual progression back to conditions of organized national well-being under forces of logic.

"Your generation," he said, "is the first that has had the first major worldwide problems of rapidly increasing energy shortages, environmental pollution, accelerated depletion of many mineral resources vital to the national economy, and the population explosion that forebodes increasingly complex technological problems of food production to avoid famines . . . . Mankind must continually penetrate into the realm of the unknown to achieve the technological advances to solve these problems . . . ."

Known for his geological explorations since he organized the long-term Juneau (AK) Icefield Research Program (first supported by the Office of Naval Research and since 1962 by the National Science Foundation), Dr. Miller is dean of the College of Mines and chief of the Idaho Bureau of Mines and Geology.

Dr. Miller's resume of professional experience lists geological explorations in many lands, including Greenland, Norway, Switzerland, Argentine Patagonia, Chile, Peru, Ellesmere Land; also, assignments for the Navy, Air Force and the Army. He was a geologist with the American Mount Everest Expedition and in 1965 was field leader of a 23-man team of scientists on the Mt. Kennedy-Yukon Photogrammetric and Geological Expedition.

Over a 22-year period (1950-72), he served as a principal investigator or geological consultant for the U.S. Forest Service, National Park Service, Alaska Department of Highways, National Geographic Society, National Aeronautics and Space Administration, Federal Office of Water Resources Research, and numerous industrial organizations.

Graduated from Harvard University with a BS degree in geological sciences (economic and mining geology), he earned an MA degree in petroleum geology in 1948 from Columbia University, and in 1956 received his doctorate from Cambridge University (England) in geomorphology and geophysics (glaciology).

Dr. Miller has served on the staffs at Columbia University, Lamont Geological Observatory, Princeton University, Michigan State University, and during 1968-70 as chairman of the World Center for Exploration Foundation (supported by some 100 major corporations in the United States.)

NASA Astronaut-Scientist Dr. Don Leslie Lind established early audience empathy in discussing "A Scientific View of Space: Skylab to Shuttle," and response indicated that it never wavered during a presentation, followed by questions and answers, that lasted 75 minutes.

Introduced by COL Donald G. MacWilliams, professor and head of the USMA Department of Chemistry, Dr. Lind detailed many of his experiences and observations as a NASA astronaut selectee since 1966. He was backup scientist-astronaut for Skylab 3 and 4 missions and a member of the rescue crew.

"What I would like to do during this presentation," he explained, "is to convey to you some understanding of the scope of NASA's space exploration program, and to give you a little insight into what has been planned for the next decade."

Dr. Lind's address was illustrated with many fascinating pictures of the Apollo and Skylab missions to complement his account of the experiments that were conducted. He also discussed some current and potential benefits of applications of the resulting advances in knowledge.

Dr. Lind described his observations and studies of results of experiments at six of the moon flight landing sites; also, the "thrill of working with many of the world's best space

(Continued on page 18)

YOUTH SCIENCE ACTIVITIES STEERING GROUP (from left) Dr. Gordon L. Bushey, physical scientist, DARCOM HQ; LTC James A. Vick, NATO representative for medical operations in the OTSG; Dr. Marcus Hobbs, former dean of Duke University and chairman, deactivated JSHS Advisory Committee; Barbara Osborne, assistant director, JSHS Program for Duke University; Donald Rollins, chief of Conferences and Symposium Office, USARO, and executive secretary of the new group; Rhonda Rice, assistant to chief, Conferences and Symposia Office; Dr. Sherwood Githens, director, JSHS Program for Duke University; COL A. P. Simkus, USARO commander, Dr. David Bailey, director, Food Sciences Lab, NARADCOM.

GEORGE, the voice-controlled motorized van, is demonstrated by COL John G. Chiarella, consulting engineer and inventor of van's electronics control system, to Ted J. Vlamis and Nicola Van der Hayden.

USARO Commander COL Anthony P. Simkus presents Outstanding Civilian Service Awards to (from left) COL George F. Leist (USA, Ret.), Dr. Maynard M. Miller, Dean H. Rines and Franklin D. Kizer.

Other recipients of the award, not present for the ceremoney, are Dr. Edward M. Eyring and Dr. Ralph Fadum.

National JSHS Program Supported by Army, Academia, Industry

(Continued from page 17)

flight scientists" in planning and conducting studies of results of experiments. He invited suggestions for consideration in future planning and responded to questions concerning his views on the potential for satellite power stations, using the sun's energy, as a long-range approach to the energy crisis.

Results of space exploration to date, the numerous stupendous accomplishments, he said, should give the American people a new sense and a prideful appreciation of the purpose of the NASA program — that it is "great adventure" and a continuing challenge to probe the frontiers of scientific knowledge.

Dr. Lind is currently a member of the missions specialist group, responsible for developing exploratory payloads for the early Space Shuttle orbital flight test (OFT) program. Awarded the NASA Exceptional Service Medal in 1974, he is a commander in the U.S. Naval Reserve. As a Navy pilot since 1957, he has logged more than 3,000 hours in jet aircraft.

Graduated in 1953 with honors and a BS degree from the University of Utah, Dr. Lind received his doctorate in high energy nuclear physics in 1964 from the University of California at Berkeley. During 1975-76 he was a post-doctoral student at the University of Alaska Geophysical Institute.

Dr. Dave Young, chairman of the Department of Chemistry at Maryville (TN) College, gave a fascinatingly provocative question to his youthful audience when he spoke on: Should We Remodel Human Beings?

Dr. Young's discussion of some of the views of advocates and opponents of genetic engineering of human beings was termed by many listeners, "the highlight of the symposium." He really "turned them on" and he had more difficulty "turning them off" as they crowded around him after a long address and questions and answers.

"Since Rachel Carson's book, *Silent Spring*," he said, "we have become increasingly aware of how modern technology has an impact on the environment. We have learned, though painfully at times, to ask questions concerning the survival of species. Increasingly, decisions about energy and agriculture are being made in . . . determining environmental alterations.

"But what about the genetic environment? What about the question of species identity? In the early 1970s the discovery of a group of enzymes called restriction endonucleases led to experiments that cleaved DNA into small units with 'sticky ends' that could be attached to DNA molecules of a different species.

"In this way, it was possible to create hybrid DNA molecules from two species. Recent experimentation has shown that DNA from mammals can be hybridized with plasmid genes in *E. coli* where they, in turn, can express their biological properties.

"Such recombinent DNA experimentation represents a process of genetic learning, that is, 'teaching' an organism something by inserting genes from another species into it. Among the potential applications is inserting nitrogen-fixing genes into corn plants and creating bacteria that produce insulin to treat human diabetics.

"But what of the potential to design species? This ability to achieve genetic hybridization across species lines means that it is time to deal with the question of how humankind might alter the course of evolution more dramatically than it has through environmental influence.

"Since 1974, scientists have been debating the safety aspects of recombinant DNA research as to possible hazards in creating novel arrangements of genetic material that have never occurred before in evolution. What if organisms are created that are pathogenic to humans or that radically upset present balances in nature?

"Important as this safety debate is, I would like here to raise the question of vision - the vision of what we are trying to do by exchanging genetic information between species. Have we not learned from the environmental debates the importance of raising the ethical and value implications of the use of our knowledge? Should we attempt to change life from the genes up?

"Do we, as biologist Robert Sinsheimer puts it, 'want to assume the basic responsibility for life on this planet - to develop new living forms for our own purpose?' And what might that mean if we decide to redesign humankind - to 'improve' on ourselves? As a starting point, consider how you would answer the following questions. Right now we say it is of value to apply our scientific knowledge to correct human deficiencies, defects and diseases.

"Should we also strive for a significant upward change in the normal range of human capabilities by changing physical and/or mental capabilities? Would you adopt an organ donation if an organ in your body failed? Would you allow your brain to be transplanted, i.e., put into another body? Would you like to be able to hibernate periodically for five years at a time? Would you consent to being frozen at death to be revived when knowledge is available to cure the cause of death and freeze damage?

"Would you consent to having plant tissue grafted to your arm for purposes of having photosynthetic skin produce sugars for feeding yourself? (Dieting could be as easy as standing in the shade!) Would you inject babies at birth with a chemical that would significantly enhance brain development, and thus produce children with two or three times present mental abilities?

"What kind of human might we construct using genes from other living organisms? What vision do you have for remodeling humankind? And if you don't have a vision, why should we attempt genetic recombination of species?

"In conclusion, consider some comments by historian Theodore Rozak: 'For all the best reasons, Victor Frankenstein wished to create a new and improved human type. What he knew was the secret of his creature's physical assemblage; he knew how to manipulate the material parts of nature to achieve an astonishing result.

'What he did not know was the secret of personality in nature . . . . And when that monstrous thing appealed to him for the gift that might redeem it from monstrosity (i.e., a female companion), Frankenstein discovered, to his horror, that, for all his genius, it was not within him to provide that gift. Nothing in all his science comprehended it. The gift was love. The doctor knew everything there was to know about his creature - except how to love it as a person.'

"It seems strange to the ears and mind to use the word love in the context of science. But with great power comes great responsibility. And when we mean to change the very nature of life on this planet, to create new species or redesign old ones, I think it is time to talk of what our vision is, of where we intend to go and what it means to love the world we live in.

"If we ask the questions of vision now, perhaps we will be spared the ignominy of a genetic Rachael Carson writing a book titled *Silent Humanity.*

"Should we remodel human beings. Such a question requires an answer of science (the what we can do) and an answer of love (the what we ought to do)."

Dr. Young currently has a dual responsibility as a half-time visiting professor of zoology at the University of Tennessee and a half-time Title III coordinator of a $250,000 grant for development of curriculum, student services, career planning and administrative improvement at Maryville (TN) College. During 1967-73, he was chairman and associate professor, Department of Chemistry at Maryville College.

Winner of the Maryville Outstanding Teacher Award in 1975, he had a National Science Foundation Science Faculty Fellowship (Cornell University Program on Science, Technology and Society). In 1959 he had a Danforth Fellowship and also a Woodrow Wilson Fellowship at Park College, from which he graduated magna cum laude.

Dr. Young received his doctorate from the University of Kansas in organic chemistry and did post-doctoral work at Cornell University. During recent years he has published numerous articles in professional media and has been increasingly in demand as an invited speaker and lecturer.

Among his professional affiliations are the American Chemical Society, American Association for the Advancement of Science, the World Future Society, and the Hasting (TN) Center for Human Values and Health Sciences.

The Humanities Address invariably through the years has been one of the most popular features of the NJSHS. Seldom, if ever, has a speaker stimulated a more enthusiastic response than Dr. Ernest Soudek prompted.

Speaking on Creating the Humanist-Scientist: An Obsolete Dream or a Realistic Goal? - following an introduction by Dr. David Bailey of the Army's Natick R&D Command - Dr. Soudek was rewarded with two rousing standing ovations, one after his address, the second following a questions and answer session.

The sight of a giant of a man, built like a tackle on a professional football team (see biography at end of address for outstanding athletic record), leaving the rostrom to walk down the aisles as he raised brawny arms in gesticulation during an impassioned appeal to his audience, is one many of them probably will long remember.

Unless more thought is devoted to creating what he termed a "new man" in the forces at work in the modern world to achieve revolutionary changes, Dr. Soudek pointed to the possibility of woeful consequences. Greatly needed, he said, is to impress upon potential future leaders a "sense of urgency" that will result in "the humanist-scientist" and the "humanist-engineer."

PANEL SESSION chairmen (from left) COL John G. Chiarella (USAR); LTC William Houston, U.S. Army Medical R&D Command, OTSG; Dr. Gerald Elkan, Department of Microbiology, North Carolina State University; Dr. Sherwood Wolfson, professor of dentistry, University of Iowa; and Dr. A. Paul Wishart, professor of education, at the University of Tennessee.

The humanist-scientist he envisions, he explained, is a "well-rounded individual versed in as many facets of human knowledge as possible." He advocated development of leaders moved by a compassionate concern to turn the marvels of modern science and engineering to "a paradise on Earth" - not a society threatened by self destruction in a holocaust of push-button nuclear war.

"We must create a type of leader who is familiar with the whole spectrum of human experience on the emotional and intellectual level; we must elect generalists to the highest offices of our nation rather than specialists.

"Our incessant search for physical and material rewards continues to increase specialization, be it in business, medicine, art, engineering or sports . . . . This expertise is not necessarily a passport to the realm of happiness. On the contrary, there is evidence that specialization increases neuroses and psychoses and, consequently, unhappiness . . . ."

Dr. Soudek then turned to a lengthy discussion of his views on how the "new type of leaders" he envisions may be developed, stressing that the distant past gives us only a few guidelines on how to proceed in the future.

"The immediate past can be more helpful because we know of many individuals in the early 20th Century who made a conscious moral decision to be a human being first and foremost - those who realized that genuine happiness stems not from individual glory but, rather, from the happiness one helps others to obtain."

Dr. Soudek then turned to a listing of many of the men whose lives have been unselfishly dedicated to helping others, dwelling longest on the contribution to the African people made by Dr. Albert Schweitzer who, he said, "should be the hero of our age - because he showed the road to salvation for modern industrial man . . . .

"The humanist-scientist should select his course of study not because he seeks self-agrandizement but because he can say, in all honesty, I love my fellow men. I love Man in his greatness and his weakness, and I want to make mankind a truly happy species . . . . We should always try to study and learn. We should always reach for the stars - but only to help man and not harm him."

Dr. Soudek is an associate professor in the Division of Humanities, Scbool of Engineering and Applied Science, University of Virginia in Charlottesville, where he has heen on the faculty since 1973. His teacbing career started in 1965 as a physical education instructor at the University of Michigan, wbere he graduated that year with a BA degree in English.

He continued his studies there to earn an MA in comparative literature in 1966 and his doctorate in the same field in 1969, climaxed with a graduate school prize fellowship. He had summer research grants (1970-72) at Rice University and at the University of Virginia (1974-76).

Dr. Soudek emigrated from Vienna, Austria, where he was horn in 1940. His wife also has a PhD degree. His listed areas of academic specialization are medieval epic and romance, German mysticism, humanism and science in Western (hemisphere) civilization. He has puhlished a numher of articles in professional media and in recent years has been growing in popularity as a lecturer.

Upon first glance at Dr. Soudek, a natural reaction is: "He must have heen quite an athlete in his prime." That presumption is supported hy his record as a memher of the track team (1961-64) at the University of Michigan which won the Big Ten Conference championship. He participated in two European championship meets in track and field, the 1964 Olympic Games in Tokyo, Japan, and was listed from 1962 to 1972 as the Austrian national record holder in the discus throw.

LONDON TRIP WINNERS. Biographical information on the five NJSHS participants whose presentations of technical papers won them trips to the Youth International Science Fortnight in London, England, July 26-Aug. 10, is focused on their science fair activities, as follows:

NICOLA VAN DER HAYDEN, 17, a high school junior, has heen a winner all the way since she entered junior science fair competition. She won a trip to the YISF with a paper titled The Lethal Ear-Tuft Trait in Modern Auracana Fowl.

Her interest was aroused as a seventh grader when she observed that one of the eggs from this species was an abnormal blue. She hought more chickens for research and also continued her study of the genetics of guppies (fish). Her effort paid off with her first award the following year in the Salt Lake City (UT) Metropolitan Science Fair.

Additional honors came to her in this fair in her freshman and sophomore years and she took first place as a junior to qualify for the NJSHS. Intent on a career in veterinary science research, Miss Hayden plans to major in biocbemistry at the University of Utah.

The 5' 10" blond is also a winner of numerous awards in a variety of sports including swimming, track and cross country running (state H.S. champion for girls). She plays hasehall, haskethall and likes to ski. Among her hohbies is raising Arahian and Appaloosa horses (loves to ride).

LORI ELLEN RHODES, 18, presented a research paper titled Characteristics of Antihiotics Isolated from Soil Microorganisms. A collection of sea shells stimulated her first research effort in her third year of elementary school and she has worked on a different project nearly every year.

She also has been a continuous winner, including research grants as a sophomore and as a junior from the American Heart Association in Indiana. She later won a $1,000 scholarship for completing the hest research project in respiratory health and was a junior when selected as "Indiana's outstanding junior scientist."

Miss Rhodes received research grants this year as a senior from the American Heart and Lung Associations and was again selected as Indiana's outstanding junior scientist. She placed 12th in the nation in the Westinghouse Science Talent Search and received seven special awards.

Miss Rhodes has heen "encouraged" hy her father, her bigh school principal now and an educator for 20 years, as well as by her mother, selected in 1977 as Indiana's outstanding high school biology teacher. "Neither of my parents has ever pushed me," Miss Rhodes stated.

Her career goal in science is to enter clinical research and she has been accepted in the Honors Program in medical education at Northwestern University in Illinois. Lori says her hohhies include needlecraft, keeping in touch with "pen pals" over the U.S., outdoor yard work, and many sports (including golf, tennis, swimming, and riding).

JOHN HAYDEN, 17, plans to enter Massachusetts Institute of Technology this fall to major in engineering and matbematics. The presentation that won him a trip to London was titled Neuromuscular Control of Machines (teletype printers), and was a first-place winner in the Wisconsin regional JSHS.

Encouraged hy his chemistry teacher, Richard Armstrong, he hecame interested in quantum theory electrons but he demonstrated his application of "simple mathematics" to develop the concept of his award-winning paper.

Hayden's father is an orthopedic surgeon and his mother is a part-time piano instructor. One of his sisters is an honor student at Smith College in Northhampton, MA, and another is a teacher. An older brother is a medical school student in Minnesota after graduating from Carleton College.

John's extracurricular activities have included participation in the student government council, serving on a school hoard committee for long-range planning, working on the editorial staff of the high school newspaper, playing roles in school theatricals, three years on the debating team, and music. He plays the cello in the puhlic school symphony and is in two other orchestras.

DAVID EDLUND, 18, earned his trip to London the easy way in contrast to the other winners. He did not enter junior science fair competition until his third year of high school when William Francis, his chemistry teacher, told him about the Army-Industry-Academia supported JSHS program.

Ahout that same time be became interested in a report on sulfur dioxide rapid reaction with ozone, which led to his first research effort - to study if the glass wall of a reactor vessel served as a catalyst.

This study carried on into his senior year when he won the Northern California and Western Nevada JSHS regional competition with a paper titled A Study of the Mechanism of Sulfur Dioxide Ozone Reaction. That put him into the National JSHS and won selection for the London trip.

David plans to join his older hrother at California State University this fall to major in chemistry. Hopefully, that will lead to a career as a chemistry professor and an opportunity for continued research. His hohhies are swimming (likes snorkeling), hiking, and camping (hackpacking into wilderness areas).

PHILIP KING, 17, a junior at Christian Brothers Academy in Lincroft, NJ, qualified for the 15th annual NJSHS and the trip to London with remarkahle ease and in incredihly short time - ahout nine months in junior science effort.

Back of his success, however, is a long period of unknowing preparation - ahout seven years of huilding electrical and electronics systems, including construction "from scratch" of a kilowatt radio amplifier, and various experimental digital electronics devices.

Some of his friends who had enjoyed success in junior science fairs told him ahout the regional JSHS competition. Stimulated hy the thought of entering a formal science symposium in competition with other gifted science students, he started a project that resulted in his award-winning paper.

Titled A Measurement of Burst-Error Correction Utilizing a Single-Error Hamming Block Code and Interleaving, this effort involved huilding an encoder, a decoder and an error counter. The last sentence of the ahstract of his paper states: "The results are conclusive; the apparatus reliahly corrects hurst-errors up to 8 hits, which is precisely the designed error capahility with i = 8."

One of Philip's early amhitions was to he a classical concert pianist and after years of instruction he was doing "quite well" with Beethovan, Chopin and the works of other great masters. Then rag time music ahsorhed him more and more. Now he divides his interests, as a listener, to hoth types.

Philip's father is microwave systems engineer with Bell Lahoratories in Holmdel, NJ, and has a doctorate in electrical engineering from the University of Wisconsin. His mother (deceased a year ago) had a master's degree in arts from the same school. Philip has taken a "lot of math courses" and plans to continue in this field as a student at Stanford University or California Institute of Technology.

EDITOR'S COMMENT: Talking to the students who participate in the NJSHS is always fascinatingly interesting - and quite frequently a bit awe-inspiring. Their accomplishments in science and numerous outside interests often leads to wonderment of how they manage to crowd it all into their lives.

Disappointment and a bit of heartbreak invariably are associated with announcement of the five selectees to attend the International Youth Science Fortnight in London. This year the editor had the privilege of hearing all of the presentations in one of the five concurrent sessions. His reaction: "Thank God I am not one of the judges! All of those presentations have been professional to a degree that would be worthy of gifted senior scientists."

DISCUSSION PANELS. Eight concurrent discussion panels contributed to the success of the 15th NJSHS, with subjects and chairmen as follows:

Medical Studies of Venoms and Toxins. Currently assigned as NATO representative for medical operations in the Office of the Surgeon General, LTC James A. Vick, recognized as the U.S. Army's leading authority on poisonous snakes, venoms, toxins and the "killer bee," opened this panel discussion with a fascinating lecture illustrated with many remarkable photographs of land and sea snakes.

World Protein Shortage. Dr. Gerald Elkan, Department of Microbiology, North Carolina State University, made a presentation on the rapidly increasing seriousness of the problem and the need to accelerate research on new sources of protein as well as improved agricultural methods.

Who's in Charge opened with a lecture by Dr. T. R. Porter, professor of Biology at Sonoma State College, Rohnert Park, CA. *Entropy and the Self-Regulation of Natural Geologic Systems* was moderated by Dr. Maynard Miller, one of the five guest speakers.

Natural Gas - Future Prospects, chaired by Dr. A. Paul Wishart, professor of education, University of Tennessee, delved into the critical current problem of shortage of gas as part of the over-all energy crisis, and what may be done to alleviate it.

Jaws - New Surgical Techniques was introduced by a report on notable advances made in recent years in this area of dental research. The chairman was Dr. Sherwood Wolfson, professor of dentistry, Univcrsity of Iowa.

Research Frontiers in Immunology, chaired by LTC William Houston, U.S. Army Medical R&D Command, produced a lively questions and answers session following his introductory presentation. His youthful questioners came up with some penetrating questions he said could be answered only by research.

George - The Voice Controlled Motorized Van was one of the highly popular features of the Symposium. COL John G. Chiarella, consulting engineer and inventor of the electronics control system, put "George," actually a new toy, through a voice response demonstration that students crowded around trying to duplicate long after the panel ended - and was continued in the Thayer Hotel lobby.

Banquet Speaker MG Ira A. Hunt, whose normal duty is director of Battlefield Systems Integration for the U.S. Army Materiel Development and Readiness Command, was also acting Deputy CG for Materiel Acquisition when he spoke at the symposium. His address was substantially a tribute to the caliber of outstanding young scientists who participate in the JSHS program, and the faith in their career potential that explains the Army-Industrial-Academic support of this nationwide effort.

Organ Recital in USMA Chapel. The concluding attraction at the USMA was an organ recital in the academy chapel by Dr. John A. Davis Jr. This has been a feature at each NJSHS for many years, and it has always proved tremendously popular. Again this year

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MARED Seminar Speakers Attest to Executive Development Priority

Importance of the Materiel Acquisition and Readiness Executive Development Program, as viewed by high-level military leaders, was attested by keynote speaker LTG George Sammet Jr., DARCOM Deputy CG for Materiel Development, and other distinguished speakers at the 1977 MARED Seminar.

About 70 recent selectees for the MARED Program participated in the sessions held at Atlanta, GA. Guest speakers included Carl Rowan, former head of the U.S. Information Agency and now a nationally syndicated columnist, who spoke about the federal manager's responsibility to the public through news media.

Among other participating dignitaries were Assistant Secretary of the Army for Research, Development, and Acquisition (RDA) Dr. Percy A. Pierre; Dr. Peter Vaill, dean of Government and Business Administration, George Washington University, Washington, DC; and Army Deputy Chief of Staff for RDA LTG Howard H. Cooksey.

Featured speakers included LTG R. E. Hails, then Air Force Deputy Chief of Staff for Systems and Logistics; RAdm C.T. Faulders Jr., assistant commander, Logistics and Fleet Support, Naval Air Systems Command; Mrs. Sally Clements, deputy for Materiel Acquisition, Office of the ASA (RDA); and DARCOM Deputy CG for Materiel Readiness LTG Eugene D'Ambrosio.

LTG Sammet discussed objectives of the MARED Program, which he said has the emphatic endorsement of DARCOM Commander GEN John R. Guthrie Jr., and requirements for developing the highest caliber managers for the materiel acquisition and readiness goals of the Army.

LTG D'Ambrosio offered his views on some of the career development educational and training opportunities of the program, a theme amplified by Gordon Kellett, chief of the DARCOM Civilian Personnel Division.

Zero Base Budgeting, one of the new concepts being implemented in many Department of Defense and other federal agencies, was the subject of David Shaw, senior associate with the Management Analysis Center, Washington, DC. BG William Maurer, deputy chief, Legislative Liaison, Office of the Secretary of the Army, gave a briefing on his functions as related to activities of Congress.

Mutuality Among the Services was the subject of a panel discussion in which LTG Cooksey, LTG Hails and RAdm Faulders spoke briefly, before the questions and answers, to emphasize the importance of understanding the RDA procedures and typical problem areas. Each of the panelists pointed out ways in which the MARED approach could have helped solve problems that confronted them in their military careers.

Special panels also were held on motivation and productivity; ethics for executives; project management; and labor-management negotiations. Chairmen were Dr. William Reif, association professor of management, Arizona State University; Dr. Thomas Stanton, vice president, Madison College (VA); BG Frank Ragano, project manager, U.S. Roland weapon system; Everett Martin and John Backus, labor relations specialists, Region 4, U.S. Civil Service Commission.

Workshops were held for five areas with DARCOM career program managers or their representatives in each serving as chairmen, namely: Grover Cox, Supply; COL V. E. Carrasco, Procurement; Seymour Gordon, Materiel Maintenance; Seymour J. Lorber, Quality and Reliability Assurance; Norman L. Klein, Science and Engineering.

(See page 35 for list of 1977 MARED selectees.)

Contractor Turns Over RPV for Further Army Tests

After 18 months of contractor testing of the U.S. Army remotely piloted vehicle (RPV) system, it was turned over late in July for additional testing by the Army Aviation Research and Development Command, St. Louis, MO.

During 65 test launches by Lockheed Missiles and Space Co., the XMQM-15, known as the Aquila (eagle in Latin) performed its mission as a multipurpose system.

Equipment aboard the 12-foot-span aircraft includes panoramic cameras, stabilized TV cameras, laser rangefinders, and designators. Weighing 140 pounds, the RPV normally flies at about 2,000 feet and is capable of flying at 12,000 feet altitude for terrain scanning behind enemy lines, enabling artillery to zero in on targets. It is expected to reduce exposure of pilots and other persons in areas of intense enemy fire. Its small size makes it a difficult target to hit.

The Aquila mission includes jamming enemy communications, dispensing propaganda leaflets, acting as a radio relay, radiological surveys, and spreading insecticide for pest control.

NJSHS Supported by Army, Academia, Industry

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the students crowded around the organ for one encore after another, long past the scheduled one-hour performance. Saturday morning buses transported the group to New York City for a tour of the Metropolitan Museum of Art.

Department of the Army Outstanding Civilian Service Medals were presented to four of six recipient members present at the final meeting of the U.S. Army Advisory Committee for the Junior Science and Humanities Symposia Program during the 15th National JSHS. Replacing the committee is a U.S. Army Youth Science Activities Steering Group.

Signed by LTG George Sammet Jr. as commander of the U.S. Army Materiel Development and Readiness Command (since succeeded by GEN John R. Guthrie Jr.), the awards were presented by COL Anthony P. Simkus, commander of the U.S. Army Research Office, which cosponsors the JSHS Program with the aid of industry and academic institutions.

Honored with the awards were COL George F. Leist, Franklin D. Kizer, Dr. Maynard M. Miller and Robert H. Rines. Recipients not present for the ceremony are Dr. Edward M. Eyring and Dr. Ralph Fadum.

COL LEIST is credited with being the founder of the JSHS Program, later approved on a nationwide basis by the Secretary of the Army and the Army Chief of Research and Development. Currently the stated purpose is:

- To promote study and experimentation at the high school level in the sciences (including mathematics) and their applications; to demonstrate the part which humanities play in the development of the scientist and engineer; to emphasize the role of science and humanities in the national culture and their application to the general welfare.
- To search out talented youth and their teachers, and recognize their accomplishments; encourage their continued interest and participation in science; and provide an environment for the free exchange of ideas.
- To assist science-oriented students in expanding their horizons by exposing them to opportunities in the academic, industrial and governmental communities; to provide understanding and reinforcement of the concept that science and technology are servants of mankind.

COL Leist became the prime mover in founding the JSHS Program in 1958 while he commanded the Ordnance Research Office at Duke University, Durham, NC. ORO became the Army Research Office-Durham in January 1961 and ARO-D was designated the Army Research Office when the Washington ARO was phased out during 1973.

COL Leist recently informed the *Army Research and Development Newsmagazine* that his actions were influenced by famed nuclear scientist Dr. Martin Teller, who told a session of Congress that he believed the 12-year-old scientist was entitled to as much admiration as the high school football player.

Aided principally by Dr. Wilhelm Jorgenson of his staff and Dr. Sherwood Githens, still one of the mainstays of the JSHS Program as a member of the Duke University faculty, COL Leist enlisted support for his idea from many sources. His JSHS Advisory Committee service award is for a 17-year period.

Governor Luther Hodges of North Carolina, many other dignitaries and about 500 state high school scientists participated in the first JSHS in 1958.

DR. KIZER was honored by his award for serving on the Advisory Committee from January 1970 to 1977. He is supervisor of science, State Department of Education, Commonwealth of Virginia. His period of service was "characterized by an outstanding growth" in the JSHS Program.

DR. MILLER, whose biographical sketch is carried at the close of our report on his address as one of the five guest speakers for the 15th NJSHS, was cited for service on the Advisory Committee from January 1972 to 1977.

ROBERT RINES, who has a degree in physics from Massachusetts Institute of Technology and a law degree from Georgetown University, is president of the Academy of Applied Science, Boston, MA. He has been nationally publicized during recent years as the leader of annual scientific expeditions to Scotland to search for proof of the existence of the fabled Loch Ness monster. The expeditions have been supported by numerous leading U.S. scientific organizations, with aid from United Kingdom researchers. His award covers Advisory Committee service from January 1970 to 1977.

DR. FADUM has been dean of the School of Engineering and professor of civil engineering at North Carolina State University since 1962. His award for JSHS Advisory Committee service was presented following the symposium and the citation credits him with "dedicated stewardship" during the period of the program's most rapid growth.

DR. EYRING's award was likewise presented later and similarly acknowledges his notable contributions to the Advisory Committee from 1970 to 1977. He is chairman and professor, Department of Chemistry, University of Utah, and is known for more than 25 publications in scientific literature.

Many of the nation's foremost educational leaders - as typified by Dr. Fadum, Dr. Eyring and Dr. Marcus Hobbs - have evidenced their strong support of the JSHS Program by prolonged service on the Advisory Committee. Dr. Hobbs, former dean of Duke University (now retired), was chairman of the JSHS Advisory Committee when it was discontinued, and he has served continuously on the Army Research Office Advisory Council since 1961.

Manpack Radio Tactical Satellite Communications Demonstrated

Experimental demonstration of a manpack tactical satellite transceiver through the Marisat satellite in orbit above the Equator over Western Africa - communication in one-quarter second over about 44,000 miles using the U.S. Army's new AN/PSC-1 system - was announced June 7.

Three highly successful tests, including the first attempt, were reported to U.S. Army Materiel Development and Readiness Command deputy CG for Materiel Development LTG George Sammet Jr., and MG John K. Stoner Jr., commander of the Army Electronics Command and Fort Monmouth, NJ.

Credited with a major role in the achievement is the Army Satellite Communications (SATCOM) Agency under leadership of COL Fred M. Knipp. SATCOM Agency is the Army project manager for development of ground terminals in the Department of Defense Satellite Communications System.

The demonstrations were announced, as the climax of three years intensive development and design work under contract with SATCOM Agency, by G. J. Mealey, president of Cincinnati Electronics Corp., who stated: "From my point of view, this is a dramatic achievement I am pleased to share with you."

Traveling from the firm's plant roof top, the radio signal used 35 watts of power from a 24-hour battery, and the return signal from the satellite came in by a 10-watt receiver. One satellite permits manpack communication over about one-third of the earth; thus, three linked satellites, it was reported, could provide global coverage.

Transmission takes two forms, voice and data. Voice sounds are converted to data, or dignitized, and reconverted to sound. The burst is described as "so fast it makes it impossible for an enemy to get a 'fix' on the position of the manpack user, or to detect his radio frequency and jam the signal - making it ideal for covert intelligence use."

The system has 7,000 voice and 35,000 data channels available for use. An Army production decision at about $15,000 each for 200 units is expected in late 1978.

Digital Message Entry Device

AN/PSC-1 Manpack Radio Set

New TECOM Mission Includes Foreign Weapons Evaluation

Expansion of the mission of the U.S. Army Test and Evaluation Command (TECOM) will include responsibility for evaluating foreign military weapons and equipment for possible U.S. procurement as alternatives to developmental items.

The new mission will be accomplished with a small staff element at HQ TECOM, Aberdeen (MD) Proving Ground. LTC Anthony M. Solberg of the Test Operations and Policy Office is the point of contact.

The objective in considering foreign systems is to obtain improved capability, decreased costs, earlier operational availability and an optimum degree of NATO standardization and interoperability, within the restraints of existing U.S. law and regulations.

"Ideally, the program will provide sufficient evaluation of candidate systems to influence the decision concerning over-all system acquisition strategy," said LTC Solberg.

Currently, Data Exchange Agreements in testing and evaluation exist among the United States and some foreign countries. The new program will utilize these agreements to increase information exchange and coordination.

Most of this exchange is now accomplished after each country has spent much money on independent projects. LTC Solberg said the new program will help eliminate R&D duplication.

DARCOM Special Features Awards

The U.S. Army Materiel Development and Readiness Command 1977 Special Features Award for publications in news media has rewarded Maureen Gour of the Natick (MA) Research and Development Command for her article titled: Steaks - Made to Order. The article appeared in the *DARCOM News,* the *National Provisioner* and *Soldiers* Magazine.

James Allingham, Aberdeen Proving Ground, MD, took runnerup honors with an article titled: HEL (Human Engineering Laboratory) Scores Breakthrough in 'Copter Research. Allingham also was nominated for the annual award when it was initially offered in 1976. Fourteen nominations were considered for the 1977 award.

WSMR Completes 4th Space Processing Applications Launch

The Space Processing Applications Rocket (SPAR) project successfully conducted the fourth in a scheduled series of 11 rocket launches June 21 at White Sands (NM) Missile Range.

SPAR is a program of the National Aeronautics and Space Administration which provides research on metal and nonmetal processing in space. Objectives are to improve processing techniques on earth and, ultimately, to produce products in space which cannot be produced on ground due to gravity effects.

The project will expand on studies made during the Apollo, Skylab and Apollo Soyuz test missions. Rockets will be used to carry the experiments into space until the reuseable Space Shuttle is completed near 1980. The test vehicle for SPAR research is the Black Brant rocket, a Canadian-built single-stage rocket used at the range for upper-atmospheric research since 1973.

The June 21 rocket launch reached an altitude of about 111 miles and provided over four minutes of low-gravity experiment time. Experiments were: (1) solidification of crystalline materials, (2) contained polycrystalline solidification, (3) containerless processing technology, and (4) containerless processing of ferromagnetic materials.

SPAR rockets are launched by the Naval Ordnance Missile Test Facility's Research Rockets Branch. The missile range provides data collection and missile flight safety support, and the Army Electronics Command's Atmospheric Sciences Laboratory provides meteorological support.

HIGH-ALTITUDE balloon takes on helium before liftoff to simulate a portion of the planned 1978 Pioneer Venus atmospheric probe mission. Launched by the Air Force Cambridge Geophysical Laboratory at Holloman AFB, May 19, the 3-million-cubic-foot balloon hoisted the test package (shown suspended from crane) to 88,000 feet over White Sands Missile Range, NM. Objectives were to demonstrate deployment of the probe parachute, separation of entry heat shield, parachute separation and descent characteristics to land on Venus.

Systems Acquisition Initiatives: Communications Up—Flowing Down . . .

Atlanta IV Seminar Deals With Improving Army-Industry Defense Effort

How can essential communication be maintained continually current between the U.S. Army and defense contractors for cooperative understanding of materiel acquisition objectives to make feasible development and production of the best possible weapon systems at the lowest practicable cost?

The Atlanta IV Army-Industry Executive Seminar at Atlanta, GA, May 26-27 - attended by some 350 leaders of defense contractors, the general officer project managers of Army weapons development, and other high-rankicg Army officers - was organized to seek realistic answers to that not easily soluble question.

Atlanta IV started as a review of programs of three similar annual Army-Industry Executive Seminars, implementing actions that followed each, and the established basis for accelerated progress to achieve envisioned goals of "partnership" for the nation's defense to build the strongest readiness posture within necessary cost restraints.

PREMISE I: U.S. industrial technology is still the most advanced in the world despite the intensive catch-up and forge ahead efforts of the potential aggressor in any global conflict.

PREMISE II: That the capability for basic research, exploratory and advanced development programs, and the mechanism for application of technological breakthroughs within the over-all U.S. defense establishment (industry, academia and the Military Services) cannot be surpassed when geared up.

PREMISE III: That despite current inflation trends, impacting upon the defense industries in high labor and material costs, diligent, cooperative "defense teamwork" can be established - making possible development and production of superior weapons systems within design-to-cost limitations but at reasonable motivational profit rates for materiel producers.

Sponsored jointly by the American Defense Preparedness Association (ADPA) and the National Security Industrial Association (NSIA), the seminar was themed on Systems Acquisition Initiatives: Communicating Up - Flowing Down.

Mayor Maynard Jackson of Atlanta, who attended the evening reception, sent a personal representative who gave the welcoming remarks following an introduction by John D. Blanchard, deputy for Materiel Acquisition, U.S. Army Materiel Development and Readiness Command (DARCOM).

Mayor Jackson's representative commented that "your scheduled program is tremendous," extended his well wishes for the success of the seminar, and talked briefly about "revitalized Atlanta" as an international convention and tourist center.

GEN Henry A. Miley Jr., former DARCOM commander and current president of the ADPA, made brief comments about the purpose of the seminar as related to the ADPA and the NSIA.

GEN Miley then introduced LTG George Sammet Jr., DARCOM Deputy CG for Materiel Development, who spoke briefly about the initial concept, purpose, and his views about encouraging progress that has been achieved to date in the series of Atlanta Executive Seminars.

John Blanchard followed with an address that detailed how the series of seminars has impacted far beyond original expectations in stimulating Army-Industry cooperation that has greatly improved the materiel acquisition process. He also mentioned the availability to industry of a new DARCOM handbook for acquisition managers. *(For a complete version of his address, please see the end of the introductory report on the seminar.)*

MG Ira A. Hunt Jr., DARCOM Director for Battlefield Systems Integration, was the next speaker and his subject was: Tomorrow's Battlefield . . . Today's R&D . . . Yesterday's Technology? He discussed the cost of the battlefield systems, a 5-year look at Army R&D, and Industry Challenge to respond to some of his perceived deficiencies in the ongoing R&D program - along with a view of the Army's 1979 budget request by mission areas. *(A somewhat condensed version of his address is on page 26.)*

MG Patrick W. Powers, commander of the U.S. Army Test and Evaluation Command, discussed one of the most provocative questions in the materiel development and acquisition cycle: Test and Evaluations . . . Necessary or Needless? . . . How Much Is Too Much? The Army-Industry Integrated Test Program, he stated, has made commendable progress within the past three years, but he believes further economies in time and money can be achieved without loss in weapons systems and support equipment reliability, availability and maintainability (RAM). *See page 28 for his address.*

LTG Eugene J. D'Ambrosio, whose complete address begins on page 24, spoke on: The Realities of Readiness, based on his observations and experiences with deficiencies as well as maintainability problems of equipment as DARCOM Deputy CG for Materiel Readiness.

LUNCHEON SPEAKER Army Chief of Staff GEN Bernard W. Rogers discussed the continuing problem the U.S. Army must solve in making the American public - the taxpayers concerned about budgetary requirements - understand the essentiality of adequate preparedness for any type of war at any time. GEN Rogers' address is featured in SPEAKING ON . . . (see inside front cover).

DISTINGUISHED GUESTS introduced at the seminar were headed by recently appointed Assistant Secretary of the Army for Research, Development, and Acquisition Dr. Percy A. Pierre, the first black incumbent of that high office, and newly appointed Assistant Secretary of the Army for Installations and Logistics Alan J. Gibbs.

Secretary of the Army Clifford L. Alexander Jr. was programed as guest of honor at the evening reception and buffet dinner but was unable to attend.

FOUR PANEL DISCUSSIONS enlivened the seminar by provoking some cogent exchanges of viewpoints, including extended questions and answers sessions.

Panel No. 1, dealing with Are the Major Subordinate Commanders Listening?, was moderated by Frank W. Lynch, senior vice president,

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DARCOM Assistant Deputy for Materiel Acquisition John D. Blanchard was the introductory speaker at the Atlanta IV Army-Industry Executive Seminar. Titled Communication Up and Flowing Down, his address follows.

★ ★ ★

I greet my briefing task this morning with mixed emotions — mixed because, on the one hand, I believe these Atlanta meetings *have* made a contribution to improving the Army acquisition process; and yet it stirs a different emotion to realize that this Atlanta IV will be the finale — in a green suit anyway — for the gentleman who has been the blood and muscle behind all of these meetings, General Sammet.

Little did we realize, some 3½ years ago, that you would be as responsive as you have been to the notion that face-to-face discussions of our mutual problems could be helpful.

And yet, right from the start we had some positive signs. The general passed me this little note about 10:30 of that first morning of Atlanta I, in May of 1974, and I believe the whole idea has been, as he then stated, "going better than either of us visualized," ever since.

I'd like to recap briefly our earlier meetings, and sort of set the stage for today and tomorrow. We came here in 1974 flying a banner of "System Acquisition Initiatives."

In '75, "Meeting the Challenge" was indeed our mission. Last year, most of our two days found us answering your questions about our "New Ways of Doing Business." I'll say a word or two more about each of these, particularly the "Communicating Up — Flowing Down" notion, with which we will be dealing today.

We came to Atlanta I with the idea of convincing you that the then Army Materiel Command was, in fact, pursuing a number of acquisition initiatives — initiatives that would facilitate the conduct of our business.

That initial meeting was a satisfying experience for the entire Army Materiel community. The exchange of ideas increased understanding among all of us. You were not shy, and we were not reluctant, about working on those areas where the exchange had made it rather clear that we had some work to do.

By February of '75 (when Atlanta II was held), we had received some high marks on the program we had implemented in "Meeting the Challenge" of the 21 problem areas you had helped us identify. A further plus was the reception given our efforts to point out R&D opportunities — opportunities made evident by events following the 1973 Arab/Israeli War.

That February meeting also brought out the need for the exercise of some tougher discipline by you — if the Army efforts to improve its business habits were to bear fruit. Last year, we broadened our interest base. The Army Materiel Acquisition Review Committee (AMARC) had completed its findings and recommendations, and we were engaged in carrying them out.

You heard from the Under Secretary of the Army (Norman R. Augustine) and also our battlefield systems architect, MG Jim Hunt — who will follow me on this morning's program. Additionally, you heard from GEN William E. DePuy, the commanding general of the Training and Doctrine Command, who spoke from the user's point of view.

Perhaps the most ominous notes (at our 1976 meeting) were sounded by the DARCOM Deputy Commanding General for Readiness, LTG Eugene D. D'Ambrosio, who will also speak with you this morning, when he addressed the subject, "A New Way of Doing Business."

The Army and all of the Department of Defense are now much more deeply committed to examination of life-cycle costs, in every acquisition decision we make. Army/Industry dialogue has been further expanded, with emphasis on systems integration, user representation, and life-cycle considerations.

We left Atlanta III, with — above all else — the message that we had a job to do in getting the word down to the people on the firing line in

our business. Those of you who were here will recall GEN John R. Deane's pledge to work on that problem.

Turning to the theme for these two days — first, we are here again to listen; second, we have been working to get the work down on improvement efforts to everyone in our business. With regard to listening, I will now discuss with you the results of the "Augustine Survey." I mentioned briefly at last year's meeting that the study was under way.

You will recall that, by Under Secretary Augustine's personal direction, we had canvassed a great many of you in this audience for your views on some very specific, very tough questions — going to the heart of how we do our acquisition business.

We then categorized and evaluated the replies to the 24 specific questions that the Under Secretary had asked. We have copies of a sample letter, inclosing the summary evaluation of all the replies, on a table in the back of the room. I invite you to pick up a copy at the break.

We have tried to suggest that when you tabulate the interests of a group as diverse as the 350 or so in this room, the answers do not follow a neat, predictable, bell-shaped curve (as depicted on a chart).

For example, those of you who have a heavy investment in R&D facilities will answer the question — whether the developer should be awarded the first production buy — quite differently from those who are heavily invested for production, but without R&D capabilities.

Now I will explore with you our evaluation of a few of the 24 questions to which you responded. I use these examples because (1) they are those (on which) you seemed to have the clearest consensus as to just what our policy should be and (2) to try to persuade you that we are not out of touch with your notions of where policy problems may exist! I would repeat, however, that determining what are your views as a body is often not an easy task.

I must also point out that the policies I show are at this time being finally staffed as part of a complete rewrite of our Army Regulation 1000-1, which governs the acquisition of Army weapons systems.

In response to Question No. 1: When should competitive procurement be employed? About 50 percent of you said the time to compete a system is when a sound (proven) data package is available — that this is an absolute essential. About half of you used a softer adjective, such as *good* or *adequate* data package.

Example No. 2 is the question: Has experience to data indicated that competitive prototyping, in the balance, is a practice worthy of continued and perhaps broadened application? About 75 percent of you answered "yes, when it promises to be cost effective"; 14 percent said, "too soon to tell."

Frankly, some of us were a little surprised at the very high percentage of favorable responses to this question. The cost-effective caveat was usually present, in rather soft terms — such as exceptions for major missile programs, or competitive prototyping programs advocating similar technical approaches. There can be no doubt from your answers, however, that competitive prototyping is well supported.

THE ARMY POLICY regarding that question (Example 2) is: The demonstration and validation of the Alternatives Phase of the acquisition process will generally be conducted with two or more competitors . . . and, whenever practicable, the full-scale engineering development phase will be conducted by two competing contractors.

Example No. 3 question: Is design-to-cost working? How can it be applied to the dominent element of cost — namely, support (life cycle) costs? Industry's answer was: "Yes, design-to-cost is working" (46 percent). Twenty-two percent indicated lack of experience to answer and 32 percent were reluctant to comment.

We welcomed *this answer*, since the Army is fully committed to the design-to-cost idea, and is making some in-roads with the life-cycle cost problem. It was, indeed, encouraging to note that almost half of you fully supported the notion the design-to-cost objective is a good one.

Turning now to life-cycle cost, Army Policy is stated: Life-cycle cost is the overriding cost determinant; design-to-cost is an aid in the process . . . . Contractual design-to-cost goals for design sensitive hardware should be set in terms of recurring hardware unit costs.

When making design tradeoffs, it will not be considered standard practice to design either to the performance floor or the cost ceiling; tradeoffs will be implemented in a manner that gives optimal over-all system cost effectiveness.

Example No. 4 of the questions we asked you was: It is useful for industry to see a draft version of a Requirements for Proposals before a competitive offer is prepared; does this produce significant dangers of subsequent protests? As expected, this question met with the highest consensus (97 percent) of any that we asked. I am somewhat surprised by even token opposition from industry to this idea.

With respect to the next question — relating to the Army policy of preparing a draft request for RFP containing proposed scope of work and military specifications and standards will ordinarily be provided briefly to all prospective offerers for comment prior to solicitation of formal bids — I was among those in the front lines convincing our people in-house that we should give it a try.

You, as a group, have clamored for years for us to go this way. But now, as I listen closely to some industry complaints, I begin to wonder. Be assured, there are a lot of our people who will argue that this is more costly in time and effort than it is worth.

General Powers will have a lot more to say about testing later this morning. I ask that you note, in addition to the 31 percent who cited duplication, there were 25 percent who suggested tailoring testing to the (specific) program.

Example No. 5 posed this question: What aspects of Army testing practices might be changed; is Development Testing/Operational Testing III useful in its present form? Industry's answer was that 44 percent favored reduced duplication, 25 percent advocated DT/OT III on a system-by-system basis; 31 percent gave various other responses.

The new Army Policy, as it reads today, would meet objectives suggested by 56 percent of industry responses as follows:

Contractor and government testing will be integrated into one test cycle during demonstration and validation, and full-scale engineering design phases . . . (in addition), test and evaluation will be designed to match the acquisition strategy of a given system and altered as permitted or required by the results of testing . . . .

Moreover, design testing and engineering and operational testing and engineering should be coordinated so that each test cycle precludes unnecessary duplication. Each program must be tailored to the unique risks and needs inherent

(Continued on page 24)

DARCOM Cites Industrial Firms

(Continued from page 4)

ly developing the Army's primary antiarmor weapon system, the Advanced Attack Helicopter. The AAH is the product of Hughes Helicopter's leadership of a diverse group of subcontractors, each chosen for proven expertise in a particular aircraft system. The lethality of the AAH as an antiarmor system and its ability to survive in the modern tank-heavy battlefield promise to be key contributors to the Army's ability to fight outnumbered and win . . . ."

Martin Marietta Corp., Orlando, FL, was cited for achievements, similarly to those of Magnavox Co., "for expanding the capability for production of thermal imaging common modules (meaning for joint use of U.S. Military Services). Martin Marietta's technical expertise and responsiveness to the needs of this program will make it possible for the Army to realize all the benefits it had planned for in future production of night vision components and systems using the common module approach."

Automated Systems, RCA Government and Commercial Systems, Burlington, MA, was cited for "development of Simplified Test Equipment for Internal Combustion Engines. Nearing the completion of the Producibility Engineering and Planning Phase, RCA has demonstrated a Design to Unit Production Cost 35 percent below the target, meeting all performance requirements and with reliability expectations 10 times greater than the minimum requirements . . . ."

United Technologies Corp., Sikorsky Aircraft Division, Stratford, CT, was cited for winning the UTTAS (Utility Tactical Transport Aircraft Systems) competition by developing the "most survivable helicopter to be placed in production by the U.S. Army. Designed to operate and survive in a high-threat environment carrying the Army's most vital resources, its combat soldiers, the Sikorsky UTTAS incorporates technology to resist the effects of gunfire, reduce detection and enhance the safety of crew and troops in a crash situation . . . ."

The Singer Co., Kearfoot Division, Little Falls, NJ, was cited for its notable success in competitive development of the Lightweight Doppler Navigation System, AN/ANS-128. "Within strict design to cost requirements," the firm "not only performed the development program at a cost 11 percent below the government estimate but came in with a production cost 54 percent below target . . . . The life cycle cost . . . promises to be significantly reduced by reliability . . . and reduced maintenance costs . . . ."

White Consolidated Industries Inc., Cleveland, OH, was cited for the work of its Blaw-Knox Foundry & Mill Machinery Inc., "to accelerate M-60 tank production . . . . In three years the expansion program . . . increased production of hulls, turrets and gun shield sets to 80 per month . . . . Blaw-Knox will complete . . . its Wheeling, WV, plant to produce 40 additional casting sets per month. Blaw-Knox is recognized for its responsiveness in meeting a critical capability need of the U.S. Army."

FMC Corp., Chicago, IL, was cited for development, production and support of the M-113 family of Armored Personnel Carriers. Since 1959 FMC has "developed and produced 18 models of the M-113 with total production exceeding 50,000 vehicles . . . . FMC has been a reliable producer, turning out quality vehicles. This record reflects the professional standards of FMC Corp . . . ."

Bertea Corp., Irvine, CA, a firm known for expertise in aeronautics, electronics, missiles, civil and marine engineering, and other areas of effort, was presented a plaque for outstanding achievements in support of Army R&D *following the Atlanta IV seminar.* Bertea was recognized as a major subcontractor for the AAH program, particularly for performance on the hydraulic flight control system . . ." on schedule and within cost (through) . . . "technical competence and excellent management."

in the program under consideration.

Example No. 6 raises the question that perhaps we have studied the most during the past year — How can the Army development/production cycle be shortened without adding undue risk?

Industry's answer showed 24 percent favoring improved initial requirement definition; 21 percent advocated shortened, intensified testing; 14 percent suggested the production decision be made earlier, supported by 10 percent in favor of a shortened government production process. Thirty-one percent gave varied responses.

Our new Army Policy picks up three of the reasons you cited for delay in programs. Combined, these answers are responsive to 59 percent of the replies we received. The statement reads:

TRADOC (Training and Doctrine Command) will appoint a system manager who is responsible for coordinating user defense of challenges which may arise as to the need of the system. Test and evaluation will be designed to match the acquisition strategy of a given system and altered as permitted or required by results of testing. Successful completion of DT/OT II . . . permits production at rates based on manufacturing efficiency, operational demand and resource availability.

Example No. 7 asked for industry's response to: When acquiring foreign-developed items for U.S. manufacture, should the Army itself obtain license rights and then compete those rights within U.S. industry — or should the Army let the industry-to-industry process establish licensing agreements?

Forty-eight of the responders said the industry-to-industry process is better; 23 percent thought the Army should handle the rights; 13 percent answered that the Army should handle rights if a unique military application is involved; 16 percent offered a variety of replies.

Of the 24 questions asked in the industrial survey, I would rather we had not asked this one — and I kind of thought six examples were enough! But as those of you interested in the Army's gun air-defense program know, this question will not go away. Since I recognize that my objectivity may be suspect on this one, I am going to read . . . from a memorandum that I asked Frank McKenna our (DARCOM) General Counsel to prepare. And I quote:

"The former Deputy Secretary of Defense David Packard signed a memorandum on this subject which provides that: '. . . As a policy guideline, DoD procurement practices should not operate to discourage or inhibit U.S. industry from forming working relationships with foreign industrial concerns relative to the import of foreign weapons system technology.' "

The Packard memorandum goes on to say: "The role of the DoD should be limited to evaluation of the competence of the U.S.-foreign industrial team, and the cost-effectiveness of its product in relationship to competing industrial teams and their products . . ."

The memorandum is an implementation of the "Nixon Doctrine." We are not aware of any corresponding "Carter Doctrine." Yet, we have not been told that the Packard memorandum has been rescinded. Based upon our own experience with Bushmaster, Roland, Divads and other similar weapons systems, we believe that the government's policy should be flexible.

From our experience, in negotiating agreements directly, we believe the best lesson to be learned is that the procurement goals should be clearly defined, particularly with respect to desired rights that the Army anticipates it requires.

These rights should be obtained, if possible, on an optional basis with consideration being a royalty based upon the procurement of the production item or, in the alternative, where a sole-source procurement from the licensor is certain, a license conditioned upon this buy would suffice.

The best establishment of industrial teams, i.e., U.S. industry forming working relationships with foreign industrial concerns relative to the import of foreign weapons system technology, seems to lead to sole-source problems. Yet, the Department of Defense and the Department of the Army are interested in establishing a competitive procurement position in the U.S., even though the product to be procured is "based upon foreign technology."

Gentlemen, let me leave this one for now. Make no mistake, we recognize that the Army and the DoD must come to grips with this problem. Perhaps we can go into it further in the questions and answers should you desire. That concludes the part of my talk directed at persuading you the Army is not calloused to your collective views on ways in which we might improve our business habits.

We do indeed listen, and I hope I've been a little persuasive that our acquisition policies are not made in the isolation of the 10th floor of the building on Eisenhower Avenue in Alexandria, or the 3d floor of the Pentagon.

You may recall that last year we had quite a bit of discussion on the problem of *flowing down* all the good words to the people at the working levels in the acquisition business. As a general effort, we communicate with our people at conferences such as this, and on a day-to-day basis — prodding — incentivizing — rewarding — and penalizing — doing all those things managers everywhere try to do — to get their people to be more responsive to the policies, objectives and ideas of management.

More specifically, with respect to flow-down programs, I am sure you have noted that we are having a panel this afternoon, with five of our young procurement people here, to try to answer your tough questions from the viewpoint of those at the working level. Also, of an even more specific nature, we have been busy since last year giving birth to a new kind of document that we hope will go a long way toward serving the "flow down" objective.

I make the reference to the DARCOM Materiel Acquisition Management Guide. I have a copy of the guide here — there will be a few copies on the table in the back of the room for your perusal. I must ask that you leave those with us. The guide will, however, be made available to industry.

We are currently working out our cost and distribution detail. We will use the roster of attendees of today's meeting to sound out your further interest in the next few weeks. For now, I would invite and encourage you to look over the copies available.

One of the biggest problems in the acquisition business is to shred out what you need to know from the abundance of detailed rules and regulations that cover every acquisition subject. We are trying to respond to that problem with a guide that will be a reliable road map to the answers, what our people, and yours, need to know!

We have provided, in a deliberately small book, access to some of our lessons learned from the school of hard knocks. Each major issue is covered on a single sheet and a map directs the user on each of the major issues with which he must deal, during the life of a program.

Included in the guidebook are a current policy statement and a text encompassing the benefits of lessons learned from prior projects. Identified are 45 key management issues, or areas, that arise during the life cycle of an acquisition. Those issues span the pre-program initiation stage through mission studies etc. — right through disposal. We comment on the issues from a financial management, logistics, and procurement viewpoint.

We show that for that issue, as for each of the issues, we provide a precise summary, and a statement of basic policy. Also, the most relevant considerations are highlighted! Our toughest questions are asked! And all significant references are cited, including an example of competitive prototyping as just one of the 45 issues.

The guidebook, by way of reiteration, provides:

1) A ready access to "Policy Regulations" through an easy cross-reference document, 2) DARCOM institutional policy on management issues that affect acquisition strategy, 3) vehicle to distill institutional memory and update as needed, 4) functional tool for acquisition memory, and 5) vehicle to flow policy information down to industry.

Gentlemen — that summarizes our major effort on the flow-down problem that you raised last year. We look forward to having the guides available in all our commands — also, one with each project manager, and the Directorate of Development and Engineering; Procurement and Production Directorates — within the next few weeks. This has been a major undertaking, but it should pay off, and I repeat we are working out arrangements to make the guidebooks available to you.

Before closing, let me say we are working the communication problem, we are working the problem of acquisition — we are not smug.

We are somewhat like the friendly moose (as shown by vugraph depicting a moose trying to figure out how to get an apple down from a tree). We think our objective is clear. We strive — and in striving — we sometimes gnash our teeth and "glop." We "snort" in anger on occasion, and I must say there have been times when we've "whammed" the problem head on.

We are not unmindful, however, of the possibility that we might lose sight of the real objective from time-to-time.

DARCOM Deputy Commanding General for Materiel Readiness LTG Eugene J. D'Ambrosio addressed the Atlanta IV Seminar as follows.

Development and acquisition of materiel is certainly a major part of the DARCOM's mission, but I would like to discuss the other side of our mission, namely readiness from a national defense standpoint.

The Army must be organized, manned, trained and equipped for prompt and sustained combat. For the Army to be ready, DARCOM and industry must be ready — ready to provide materiel and support to meet wartime demands on short notice and for an extended period.

Probably it comes as no surprise to you to hear that DARCOM faces the specter of continued resource reductions. In the past 15 years, DARCOM's manpower has been cut practically in half. Meanwhile its mission has expanded, due in part to the change in tooth-to-tail ratio — more combat spaces to fewer support spaces.

We pat ourselves on the back for doing as well as we are in light of our limited resources. Imperative though is that we remain mindful the mission we are accomplishing is one that is meeting peacetime needs. We must ask ourselves if DARCOM can expand and accelerate its operations to meet wartime demands, and we must ask the same question about industry.

We have to be ready for war, for any sudden onslaught. We must attain and maintain the ability to accomplish a wartime mission and meet the resulting workload surge demands.

Simply stated, even in peace, we must be ready for war.

We believe that the next military conflict, if there is one, will come quickly and with little or no warning. We will not have the luxury of several months or years to convert our production base from standby or peacetime status to a wartime posture. We must be able to convert within a few days or weeks if need be. Right now, that capability is highly suspect.

This situation is the natural result of the extreme competition for money, particularly for operation and maintenance appropriation funds. If DARCOM is to reverse the reduction trend and obtain the money and resources needed to achieve an acceptable level of readiness, then we must effectively illustrate the adverse impact these cutbacks are having on the Army's readiness to fight a war.

We must convey the seriousness of the situation to the people who control the purse strings. But before we can do that, we must be able to measure and articulate, in terms that can be understood and digested, exactly what DARCOM's role is as well as the readiness of DARCOM to perform that role.

We are currently developing improved procedures for assessing the logistics readiness of the total Army, starting with forward units and ending with the CONUS (Continental U.S.) Army base which includes DARCOM. We want to know, for example, if all elements involved in the DARCOM mission are collectively ready for war. Our emphasis is on determining our ability to support a fighting force.

We are examining such things as the ability of the industrial base to absorb the work surge. This embraces money, people, training, facilities and equipment. It includes our depots, arsenals, ammunition plants, inventory and maintenance points; also, our automatic data processing and communications capability.

As we watch our manpower decrease, as we watch inflation attack our dollars, as we listen to Congressional attacks on our defense budget, it is imperative that we make known the true status of our readiness for war — the resources needed to ensure that we can support Army forces in wartime, should it become necessary.

Assessing exactly how ready we are is not a simple task. It is too easy to view the cumulative readiness condition of the fighting units as a valid indicator of total Army readiness. The readiness condition of fighting units is certainly a factor to be considered in any readiness assessment, but it is specious to view it as a mirror of total Army readiness.

Take, for example, the Eighth Infantry Division in Europe, which is REDCON 1 — meaning it is ready for war. It has all its prescribed personnel and equipment, trained and serviceable respectively, and thus appears maximally ready. But this is a surface appearance which in truth indicates only that the unit is ready to fight with its on-hand assets for a few days, a week at the most.

After the first attack wave hits and the on-hand ammunition and equipment are greatly diminished or depleted, the fighting unit is going to reach back to DARCOM for replacement materiel. We have to be ready to respond adequately — to be able to provide wartime support and to mobilize our people and facilities smoothly and quickly.

Our job is a big one and one that requires the help of industry. In a very real sense, DARCOM and industry are partners in this business of readiness. In the wake of recently imposed resource constraints, we are increasingly reliant on private industry to play a large and active role in peacetime as well as in wartime.

DARCOM's readiness depends on industry's readiness. I suggest that industry take a look at itself and assess its ability to accelerate or redirect production as necessary to aid a war effort. Necessarily, the Army depends upon industry to maintain a warm production base designed to meet wartime materiel requirements.

We cannot compel but we strongly encourage you to devise a workable contingency plan in this regard. You may indeed have the capacity to assume a wartime production posture; but if it takes six months to convert, then it is quite possible your contribution may come too late.

The fighting unit, the guys on the front, are only as ready as we in DARCOM and you in industry are. The old axiom, that "a chain is only as strong as its weakest link," applies to the requirement. The fighting unit, DARCOM, and industry are the links of that chain.

In assessing the Army's readiness, we are having to look at concepts and configurations we have never proven in a war. You know that in past conflicts the Army positioned massive amounts of supplies in the active theater. We had large oversea depots and intermediate depots along the main supply routes.

Those of you in my age bracket may recall the Communications Zone, where we stored overseas up to 180 days requirements for supplies. Well, all this has been eliminated. Now when the soldier reaches back for more ammunition or a tank, only DARCOM is there to meet his requirements. If our fill rate fails to keep pace with the battlefield consumption rate, we have some pretty obvious problems.

Because of the money crunch, we don't have the quantity of war reserves and ammunition we would like to have positioned in Europe. Again, this is something that is all too easily overlooked when assessing readiness for war.

This fact, however, does not cause us to label the European theater as not totally ready for war. Until now, we did not really consider the European theater's readiness for war at all. As I mentioned earlier, we evaluated the fighting units only — and went about our merry way believing that if the fighting units were REDCON 1, then surely the entire theater also must be ready.

In addition to the availability and positioning of war reserve stocks, we must also be concerned with the capacity of our automatic data processing systems. Computers are now our critical communications link to the battlefield. We must question their adequacy and versatility to handle a wartime volume.

DARCOM also is greatly concerned about the ability of our depots to handle the work surge. When I ask a depot commander if his installation is prepared to meet wartime requirements and he tells me that he is several hundred people short of being able to meet peacetime requirements, then I know we have some serious soul searching to do.

In addition to the depots, DARCOM has responsibility for the Army's 28 ammunition plants, 13 of which are standby plants that theoretically would become operative during war. However, in examining these standby plants, we find many to be in a state of disrepair. So, as part of our effort to improve our readiness level, we have launched an ammunition plant modernization program to ensure that these facilities could be activated with minimal delay.

Certainly there are other organizations that play a big part in providing support to the fighting unit. The Defense Logistics Agency (DLA) supplies much of the Army's petroleum and about 50 percent of all repair parts. The capacity of DLA to expand and accelerate its operations to meet wartime demands should certainly be considered in any assessment of Army readiness.

The same requirement holds true for the General Services Administration, the Military Traffic Command, the Military Airlift Command, and the Military Sealift Command. Are they ready? Concurrently, we need to know if industry is ready to lend a hand or at least if it is willing to make good on its promise to be there when we need help. Army-wide reductions in supply and maintenance manpower dictate a need for additional contractor support.

Although we know that industry is ready to perform various contract support in peacetime, we need to be sure of willingness and ability to carry on this work in wartime. Not only might the surge in workload pose a problem but so might the conditions under which the work might have to be done, especially overseas.

Last year's flare-up in Korea about the tree-cutting incident comes to mind. When things got a little hot over there, many contractor employes got on the first plane back to the States. Naturally, the Army wants to know if it can depend on industry to stay with it when the going gets a little rough. We would like some assurance that your commitment is a strong one.

Nonetheless, let me assure you that the Army wants to do business with and nurture its relationship with private industry. Industry can play a big part in helping us to clean up our own backyard. We would like to expand the use of warranties on items we procure from industry. Although we have been using warranties for some time now, the results vary.

In some cases we have received excellent warranty service from corporations and their dealers. In others, we have been less than satisfied. There have been lengthy delays in obtaining service as dealers have ploddingly examined and questioned every claim. Those kinds of delays in service reduce unit readiness.

We have a task force looking into the over-all warranty situation. We want to find a better way to manage the Army's warranty program. We are not seeking favors. We are quite willing to pay for a fair and workable warranty. The warranting of your product in peacetime leads us to believe that we can count on it to work correctly on the battlefield.

Reliability and maintainability are vital in the readiness business. I believe industry is doing an excellent job designing reliability and maintainability into weapon systems. Keep up the good work!

If an item has a reasonably long interval between failure, the unit naturally gains a greater level of readiness. Additionally, the CONUS base is not forced to procure, store and ship such a large quantity of replacement parts, modules and assemblies.

Necessarily, we seek simplicity. Simplicity in operation, servicing and fault isolation contributes greatly to improved readiness. I know this is not as simple as it sounds, and may very well seem paradoxical to some of you. Here we are on the one hand asking you to build complex and highly sophisticated systems, and on the other we are asking you to keep it simple.

You must remember, however, that the soldiers who operate and maintain this equipment are not graduate engineers. They are your sons and daughters and we should strive to make their job no more difficult than it already is.

One area in which industry can be of great assistance is data collection. The Army has acquired and effectively deployed many weapon systems, but our efforts at data collection have frustrated us. One reason for this frustration is that we are reluctant to impose any additional workload at the soldier level. Another is that it is extremely costly to place full-time data collectors in the field. Nonetheless, we are experimenting a little with both approaches.

The one approach is to have a contractor representative live with our artillery units in the field for three years. The data collector records in detail everything that happens with the system and his people document and process the information through corporation headquarters.

The information is then turned over to the system manager who uses it to improve the existing system or improve the design of future systems. The product is extremely good, but very expensive.

Another approach is to collect data on an exception basis, using mailed questionnaires or dispatching special data collection teams. This approach garners data, but all too often the

product is sketchy and inconclusive. The bottom line is that we have not found a happy medium.

Private industry, to a large extent, enjoys a much greater proficiency in data collection than does the Army. We invite you to share your data collection successes with us. The assistance you provide in our efforts to improve ADP procedures will help us surface some of the real indicators of our readiness for war.

Another area of effort receiving the attention of top Army officials is that of improving Army publications, a program called Improved Technical Documentation and Training. Our objective is to simplify composition and layout while increasing the publication's value as a teaching aid in formal classroom and on-the-job training.

Decisions are pending on the new manual's final appearance and method of integration into weapon system programs. When the Army makes its decision, it will call on private industry to do most of the work.

Although we are intent on achieving simplicity in our publications, we must do so at an affordable price. Simplicity and affordability are not incompatible; we are working on finding an acceptable middle ground. A soldier's manual that thoroughly covers the subject, and which can be easily and quickly understood by the soldier, is a definite readiness asset.

I would like to mention one other area of activity in which we invite your help — the packaging of ammunition. We are seeking better ways to package, ship and handle ammunition, starting at the manufacturing plant and ending in the gun chamber.

We pack and box our tank ammunition today in much the same way as we did in World War II. The packaging is excellent insofar as protecting the ammunition is concerned, but it poses problems to the tank crew in unpacking and stowing it.

Additionally, the packaging is expensive and creates some environmental problems; for every ton of tank ammunition fired, a half ton of containers and associated packaging debris are strewn over the battlefield.

We certainly don't want to reduce the protection to a level that might jeopardize the condition of the round or the safety of the tank soldier; however, there must be a way to simplify the current method while affording easier entry to the gun crew. If you have made strides in this area, we would like to learn about them.

I hope that from this talk you can see that Army readiness is everybody's business. We all must be able to react quickly and decisively to stem the tide of aggression. If we in DARCOM and you in industry are not ready, then the Army becomes unable to serve as an effective deterrent. Consequences this invites are chilling.

DARCOM Director for Battlefield Systems Integration MG Ira A. Hunt Jr. gave an hour-long, rapid-fire presentation on some of the problems in his area of responsibility, as related to desired major industrial effort for aid in their solution. He used more than 60 vugraphs to illustrate his talk, the major portion of which follows. Space limitation compels condensation.

Providing the equipment the Army needs to be prepared to fight fast-paced, combined arms battles with reliable, highly lethal weapons is getting to be a real challenge as we cut back on our funding and as we see the Soviets getting stronger and stronger.

Today we will discuss how DARCOM is meeting this challenge — how we are meeting it with the help of industry by working to keep you better informed than ever before about some exciting things we are doing. The idea is for the Army and industry to work together as a team to get the best possible equipment to the soldier in the field.

I think the Army has made tremendous strides over the past few years in defining exactly what our mission is. We have gone to the Congress and to the Office of Management and Budget and they like what they see. They like the idea that the Army is finally speaking with one voice as to what our missions are and what types of equipment we need.

I want to tell you about those various missions and explain a little about how they are tied together, because if you are going to do business with the Army, you must understand them.

We have made a lot of studies and analyses and we have come up with the nine major mission areas of close combat; fire support; combat support; air defense; combat service support; intelligence, surveillance and target acquisition (ISTA); command systems; logistics; and other (miscellaneous).

This allows us to roll up items and compare what we are doing in each area. In the close combat area, for example, they are tied together in 39 functional groups and more than 500 weapon systems.

Everything starts with a threat. Then we have the ISTA (Intelligence, Surveillance, Target Aquisition) — find the enemy. Then we have our combat troops — the infantry, the armor, the combat aviation, etc. They are supported by our combat support — our engineers, nuclear, biological and chemical, etc.

We fire and put steel on the target with fire support and air defense. Naturally, we have to support everything, meaning medics, maintenance, etc. Back in the Continental U.S. we have our logistics system and "other" (primarily ballistic missiles and training devices).

Tying this whole complex thing together is our command and control system and, frankly, this is one area in which we are not doing very well; we are going to have to work with our sister services to do better.

That, then, is the way the Army fights. Now, in each of these nine mission areas we have established cohesive functional groups of equipment. There are 39 major subgroups into which we divide our cost analyses and effectiveness studies. For example, we divide the close combat mission area into the functional groups of tanks, mechanized infantry, antitank, combat aviation, and light weapons.

Within each of these functional groups come the Army systems, and the Army is a very complicated organization. The commander in the field must orchestrate a lot of equipment, men with different job specialties, etc. This is extremely difficult. You can gain some insight on just how complex all this is by looking at a few of our antitank systems.

(MG Hunt at this point showed a chart depicting eight major product improvement or development systems that are conducted under a project manager.)

Now let's talk about the threat. These are four aspects to the threat: concept, equipment, numbers, vulnerabilities. The Russians have a very simple, very basic concept they have emphasized time and time again in their open literature. It is a concept they got the hard way — from the Germans who invaded Russia in 1940.

On this next chart I have quoted verbatim from the order signed by Hitler. I think it is a classic in how to write. Note that the bulk of the Russian Army is not to be simply defeated, but annihilated . . . "in bold operations by deeply penetrating Panzer wedges . . ." The Germans were actually outnumbered but . . . you see the results.

Well, the Russians have studied this until it has become their basic blueprint. They played it back on the Germans in '43 and '44, so they really learned a great deal from this massive defeat.

As a result of all this, the Soviets now have certain key tactical perceptions: surprise, concentration, bold armor thrusts, destruction of enemy air, and momentum. Now, the key word here is momentum.

When the Soviets attack, they are going to have momentum. It is not going to be assymetrical; they are *not* going to worry about men getting killed the way we worry. They are going to run them in there, regiment after regiment, division after division, and they are going to make sure that the momentum is maintained.

We, meaning industry and the Army, must keep this threat in mind because if we are not looking at the threat we are not going to be able to develop the equipment we need. Let's take a look now at some of the equipment the Soviets have. *(MG Hunt then showed vugraphs of Soviet weapon systems including guns, tanks, aircraft, missiles, combat vehicles, air defense systems and rocket launchers. Shortage of space prevents showing of these illustrations.)*

In many cases we are trying to get into the field equipment that the Soviets have had for 10 years. That means we are playing catch-up, and we all know the reasons — the Vietnam war and others. But the fact remains that we no longer have the over-all weapons quality superiority over the Soviet Union we formerly had.

The quantity picture is just as dark. We outnumber the Soviets only in the area of helicopters and that gap is being closed rapidly. So we have to sit down and assess the Soviet concepts and their equipment quality and quantity.

That requirement relates to why we have an elaborate intelligence system in DARCOM, a system of which many of you are not aware. It is a very good system, consisting of three main components: the Foreign Science and Technology Center (FSTC) at Charlottesville, VA; the Missile Intelligence Agency at Redstone Arsenal, AL; and the various local foreign intelligence offices.

Their mission is the ensure that we have superior battlefield equipment, to prevent technological surprises, and to take advantage of beneficial foreign developments. But they can also help you in American industry.

If you have questions on the threat or if you want to know something in detail, get your contracting officer's representative and visit one of our intelligence activities. The staff will be more than happy to help you because that is their job.

Now, one of the things we always talk about is how big the Soviets are and how strong they are. But I think we are putting the emphasis in the wrong place. There is no doubt about the fact that the Soviets are strong — but they also have tremendous weaknesses. If we are going to win, we are going to have to exploit these.

Two of their major weaknesses are command and control, and mobility. Let me tiptoe over some of the facets of Soviet mobility we could exploit. This chart shows the number of vehicles, tracked and wheeled, in the two main types of Soviet divisions. They have over 500 tracked vehicles, but they have more than 2,000 wheeled.

This fact is significant because wheels are road-bound; wheels are vulnerable. Not only that, but when the Soviets go to war they have as their main tactic the meeting engagement. They will have an advance guard out and will come in multiple axes.

The point I want to make is, in such an en-

gagement their vehicles are stretched out from 60 to 100 kilometers. This means that when it comes to engaging the enemy, the Soviets don't have that fantastic force ratio of 5 or 6 to 1. When a battle starts, it starts with a ratio of 1 to 1 or maybe even less. Of course, they are trying to bring all their forces up as quickly as possible and overwhelm us. But if we can fight them off as they come up, we can maintain an advantageous force ratio.

Considering the meeting engagement and the classic breakthrough, the tail of their columns, as I mentioned a moment ago, is generally 60 kilometers or so back. That means it will probably take four to five hours, at the fastest, for them to close.

We, therefore, have a lot of time and we have a force multiplier, which is very important. If we can do the job in target acquisition and command and control, we can hold off the enemy while reinforcing our own forces. This will ensure that the force ratio is in our favor.

We can summarize the threat, then, by saying that the Russians have a sound basic concept, and they have good equipment in sufficient numbers to carry it out. But they also have vulnerabilities and we must exploit those vulnerabilities. Let's switch gear a little now and look at what we have in the field today. Where is our money going?

Note that it costs $7.79 billion (as shown in vugraph) to keep an armored division in the field for 20 years. Most of this cost goes into tanks, but you can see that supply and transportation and maintenance is more than tanks. Up at the top we see that our investment in tanks is 40 percent of the total investment but the people who run the tanks (MPA), in some cases E-3s and E-4s, make up only 8 percent of the total manpower cost. This is rather interesting.

Signal equipment, on the other hand, does not cost much to buy but it costs a lot to operate, so we should be developing signal equipment that is not so manpower-intensive.

Here in our reconnaisance, surveillance and target acquisition we are not spending much. If we spent more, we could reduce the amount spent for cannon artillery dramatically, because as we reduce our target location error we need fewer rounds. I think you can see now that these kinds of analyses help us determine, from a cost point of view, what we need.

We have talked about cost, now let's talk about effectiveness, and we can talk about effectiveness in two ways. First of all, using tanks as an example, we can talk about the incremental improvements. We can ask, "What will the XM-1 give us that we could not get from the M-60, and what did the M-60 give us over the M-48?"

The real tough question is, "What impact will this improved tank have on improvements in other areas, such as the field artillery?" We are trying to answer that one now. We are going to have to get those answers in order to ensure that we are spending our money in the right place. When we talk about equipment capability or effectiveness, we generally are talking about the three major capabilities: firepower, survivability and mobility. Using these three major capabilities we can play war games in order to analyze our over-all force effectiveness.

In war gaming, we take our committed forces and, applying current tactics and training, analyze their effectiveness under different conditions. One way we do this is by varying our strength in one of the mission areas I talked about earlier.

You can learn a lot from this kind of analysis. For example, one thing we found out is if you bring in attack helicopters and they start killing off enemy tanks, it is great for the attack helicopter. But with the loss of enemy tanks, the effectiveness of our own tanks and other fighting vehicles drops. So what is our total force effectiveness?

Given this type of scenario, how many tanks and fighting vehicles do we need? These are the kinds of questions we are now trying to answer. The one thing you notice when playing these games is that the seven major categories of battlefield weapons are all linked together and interdependent. A change in one will invariably impact on one or more of the others.

Now let's look at this another way and take the tank as an example. Note that in firepower (as shown by a vugraph) the tank is one in many while in survivability it is reversed since many things kill the tank. So our tank kills the things indicated by the double-pointed arrow. But note, too, that, with the exception of "other," they all can kill the tank.

Now let's say that we are going to improve the firepower of our tanks — great. But if that improvement is simply a round that zings better, what is it going to affect on the other side? It will affect only the enemy tank because we can kill the BMP right now. But, on the other hand, let's say we are going to get a tank that is much more survivable.

What will happen? Well, if you make the tank more survivable you are going to affect every one of these things that are killing our tanks. In fielding the XM-1, the Army is fielding a much more survivable tank.

Let's change this thing a little and substitute our mechanized infantry vehicle, the M113, for the tank. What's the M113 going to kill? Nothing — it does not have a gun. It is not contributing to the battle. Yes, it is hauling people and the people contribute, but the vehicle itself contributes nothing to the battle. It is not like the BMP that carries a 73 and a Sagger. This is why we need the Mechanized Infantry Combat Vehicle (MICV), and we need it badly.

Now, if you play this game with numbers you can get some idea of the importance of the tank even today. Referring to the last chart, you will note that 48 percent of our combat value comes from our tanks.

About 84 percent of the Soviet's value comes from *killing our tanks.* Look at what their BMP contributes in this force structure as compared to the tank — it is very high. So with this type of analysis we are learning a lot; we think we know where we are going.

We can also come up with little gems that, while nothing profound, will give us greater effectiveness on the battlefield. For instance, we know that when we put the XM-1 into the field the value of the Soviet air-to-ground missiles goes down. But at the same time their tactical air (power) will get more important because that's the way to kill tanks.

But when tac air gets more important, our air defense jumps in value because we are killing what is important to the enemy. This is a very interesting linkage because it tells us that we ought to be fielding a good air defense gun at the same time that we field the XM-1 tank. And that is what we are doing. Again, this points up the value of our analyses.

Some of you may remember that last year I gave you a list of what the Army needs. But we now have a better vehicle that will tell you in great detail what we need, and it is available to you. It is one of the things we are really excited about. There are actually three ways that industry can find out what the Army needs so that you won't spin your wheels.

The first way, as I already mentioned, is for you to take much better advantage of our foreign intelligence system. The second is something new called the Science and Technology Objectives Guide (STOG). The third way, also new, is through the DARCOM Spider Charts document.

The STOG is a Department of the Army document that gives you general requirements. Two years ago we said, "Look, we have five requirements documents and we don't even know which are most important. Knock this off and get one requirements document."

The 1978 STOG has been published within the last couple of months and it is in accordance with the mission areas I have talked about. It is available to industry but it is a confidential document so you will have to send in a clearance. It will tell you what the Army wants in each of the mission areas.

The Spider Chart is a DARCOM document that gets down into the specific tasks to relate what the user wants and what we are going to try to give him. Let me give you an example of how the Spider Charts work.

In this case (as shown by a vugraph) we are talking about the improved light antitank Viper weapon in the close combat mission area. Let's just talk about the firepower. The three biggies under capability are survivability, mobility and firepower; then we have three others, sensing, communication and support. Now under this subsystem that provides firepower, let's talk not about propellants but about the launcher.

We ask, "What is the operational capability the user wants?" He wants not only to kill tanks but to knock down buildings when we are fighting in built-up areas. So what is our problem? Our problem is, we don't know what it will do. We lack data. So we are testing it.

We can look over on the chart and see that the Missile Research and Development Command is responsible for Viper within DARCOM, within the Training and Doctrine Command (TRADOC), you see that it is under the cognizance of the infantry and carries a "C" priority, meaning essential.

All of this information is contained in the STOG. That's why I say that no self-respecting guy from industry should be without either the STOG or the Spider Chart.

This next chart shows where we will be spending our R&D money during FY78. You can see that we are putting 16 percent of our money into ISTA and Command and Control. That probably still is not enough, but it will be going up. The Army is still focusing on firepower because the delivery of bullets is the end game. But you can see that mobility, survivability, and sensing have come up in our total R&D budget of $324 million (exclusive of basic research).

This is the way our R&D money is divided: close combat, $114.4 million, 35 percent; fire support, $44.6 M, 14 percent; other combat support, $38.0 M, 12%; air defense, $34.0 M, 10%; combat service support, $35.1 M, 11%; intelligence, surveillance and target acquisition, $27.5 M, 9%; command and control systems, $23.0 M, 7%; logistics, $1.6 M; other (BMD and training development), $5.8 M, 2%.

A comparison of 1978 and 1977 fiscal year Technical Base programs shows a total increase to $114.4 M (from $73.0 M) including a jump to 51% from 44% for combat aviation and to 21% from 3% for antitank weapons. Our light weapons R&D was cut from 7 to 6%, tanks from 23 to 20% and mechanized infantry from 16 to 9%. A further breakout of FY78 funding totaling $324 M shows 33% for firepower, 23% for survivability, 15% for mobility, 11% for support, 11% for sensing devices, and 8% for communications systems.

The point I am trying to make is this: Army R&D is a living, moving thing. It does not just go blindly plodding along. We are trying to do what is necessary to meet the threat, and we are trying to let you know what we need to meet it.

The Army is not all-knowing. We know there are many things we should be doing that we are not doing. That is where you in industry come in. Come to us when you think we should be doing something that we are not. When you do this, you become an important member of this team. If you will do this, and if you will help us keep our costs down and our effectiveness up, then truly we can be partners in defense.

I can then draw this conclusion — that we are going to have an integrated approach to ensuring that yesterday's technology is being applied to today's R&D to provide tomorrow's battlefield with the best equipment possible.

Crux of a Critical Problem: How Much Materiel Testing is Enough?

MG PATRICK W. POWERS, commander of the U.S. Army Test and Evaluation Command (TECOM), headquartered at Aberdeen (MD) Proving Ground, opened his Atlanta IV Seminar speech with a vugraph: Testing Necessary/Needless - How much is enough? He continued:

My subject is one quick way to start an argument! But these vital questions come to mind if you ask whether weapon systems meet user requirements in the most effective, valid and economical manner.

My approach in attempting to answer these questions is to review the testing aspects of yesterday, today and tomorrow. I will wind up with some suggestions as to how we can press on in the crusade against excessive time and costs. The question is: How much (testing) is enough?

It is always difficult to say just how much is enough. Webster defines enough as "to the required degree or amount." A possible answer is: That necessary to assure the most effective weapons system with the most economical over-all expenditure of project funds and time.

As we all know, the actual amount of test and evaluation of a weapons system is often the result of many compromises, to include time and costs. But critical performance issues must be answered, as a necessity.

(MG Powers, at this point, showed a series of vugraphs depicting weapon systems that were destroyed, damaged or failed to perform effectively under stress of severe environmental testing.)

There are almost always, he continued, some failures during tests in every program. But test failures alone are not a meaningful indicator. How do you know when you overtest or undertest - too much or too little?

The most obvious indicators would be when there are no problems after the item is deployed - or, on the other hand, when you get a system in the field that has all kinds of operational deficiencies. Here again, we still may not be sure of the cause. Did we overtest, undertest, perform the wrong test, or was the test design incorrect?

The design of testing is based upon experience, regulations, military specifications, results with similar hardware, and simulation, among others. We already know how to test most systems for technical performance and contractual specifications. But the acid test is in the operational environment, with the troops subjecting your good equipment to the outer limits of endurance and performance.

After showing four slides of equipment that failed in troop field tests, MG Powers continued: There are many other factors besides a good test design that impact on a viable test program. Here are some. The test community must work closely with the developer and industry to juggle these factors so that we are responsive to milestones, yet provide a system that fully meets the user's requirements.

Integrated logistics support is a most important factor now given renewed emphasis, with training devices and combined technical and training publications highlighted . . . .

I am not only talking about some old weapon systems that may be dressed in a new prototype, but also about some elements of the old test cycle that still haunt us . . . . Engineering development test, engineering test, service test, and initial production test Hall supported the test cycle. It was built on a foundation of sequential and redundant testing.

We had the developer, contractor and TECOM each conducting development testing in a heel-to-toe fashion. Then, as a result of the 1970 Fitzhugh Blue Ribbon Defense Panel, we established the OTEA (Operational Test and Evaluation Agency) which added to heel-to-toe testing.

All in all, we had four testers, each acting independently. There was much duplication and room for criticism. Needless to say, testing then was not cost effective. But that was not quite as bad as it appears.

We did produce some fine weapon systems, some were mediocre, and some we would rather forget. The Huey helicopter, TOW missile, 8-inch self-propelled howitzer and the 5-ton truck family were good examples.

Remember that many of the developments of the recent past served well in Vietnam combat and continue to be in demand worldwide, through foreign military sales in competition with hardware from other countries.

The Industry-Army development team has much of which to be proud, in this respect. Then, in 1973, the Army Materiel Acquisition Review Committee (AMARC) came along and had a profound influence on the Army test process. As a result of their recommendations, the Army implemented the Single Integrated Development Test Cycle (SIDTC). The primary objective was to eliminate duplication in development testing.

SIDTC emphasizes the total integration of development testing, and the combining and concurrency of some phases of development and operational testing. It aims at having everybody on board at the start - user, developer, contractor, testers and logisticians.

I believe that SIDTC's most important contribution has been to introduce more precision and discipline into testing, and to emphasize the independence of evaluation. *(See page 7 for article on TESTFACS Register as an aid to SIDTC and page 15 for article titled TECOM Updating Test Resource Management System Capabilities.)*

However, the scale had been tilted too far. Time and cost reductions did not meet expectations. There was too much duplication in development testing. Independence of evaluation from the developer needed to be stressed. Critical test issues had to be defined better so that development testing (DT) and operational testing (OT) could be evaluated.

More concurrency of some test phases was required to compress the length of test schedules. The entire test and evaluation community needed to coordinate requirements and programs as early as possible.

Now we are beginning year three of SIDTC. Significant changes have been made in the test cycle. The foundation has been repoured. The floor is integration, not heel-to-toe testing. The foundation is independent evaluation and not independent testing.

Sequential development testing has been significantly reduced; test integration is now the rule, not the exception. Also, there is emphasis to integrate development and operational testing to the maximum practical extent. The Army is emphasizing widespread use of all valid test data.

I am sure that you are aware of the organizations responsible for testing within the Army. You may not be aware that management of testing within the Army today is also undergoing change.

DT is conducted principally by those of us here today in DARCOM (Materiel Development and Readiness Command) who are responsible for about 98 percent of the Army's combat materiel development. The Army Materiel Systems Avalysis Activity (AMSAA) evaluates some 50 major projects. TECOM evluates the remaining 280-plus development projects, and remains the principal test organization.

Operational testing is managed and evaluated by OTEA. Testing for lower-priority projects is conducted by the Training and Doctrine Command (TRADOC). Unlike DT, operational testing stresses the independence of testing as well as evaluation. It is conducted in realistic field conditions, addressing doctrine, tactics, logistics, and training.

Harsh realities of field employment often result in significant reductions in weapon performance from that produced in DT or by the contractor. That is why early DT, which simulates the operational environment, is so important.

The Test Integration Working Group (TIWG) plays a major role in today's materiel acquisition process. It includes the developer, OT tester, OT evaluator, DT tester, DT evaluator, contractor, logistician and user.

For example, in the ground-emplaced mine-scattering system program, usually good results were due to TIWG meetings. Hardware reductions of approximately 80 percent were accomplished through integration of DT, OT, contractor and developer tests. Some tests were completely eliminated through integration of required tests. Further reductions were achieved by changes to test methods and procedures, and use of dummy, less costly prototype mines.

In the Improved TOW Vehicle Program, the TIWG substituted laboratory simulation for actual testing. This simulation is conducted so that potential durability problems of the TOW's interface with the M113 can be quickly isolated. The terrain motion simulator uses actual motion profiles from tests at Aberdeen and Yuma PG courses, on tape.

Use of this simulation permitted the TIWG to make the prototype available for other necessary activities, such as the maintenance evaluation, electromagnetic interference testing, and training.

Another example is the Cannon Launched Guided Projectile (CLGP), or the Copperhead Program. In this case the TIWG achieved $2.3 million cost avoidance by reduction of 764 fully guided test projectiles.

Still another recent example is the Hand-Held Laser Rangefinder (HHLR). During the DT II of this system, contractor laboratory environmental tests were observed by TECOM engineers. Independent TECOM laboratory efforts were thus able to be completely eliminated.

We are doing better in the quality of contractor data being received and the amount of data we are using in TECOM evaluations. For example, this (as shown by vugraph) is the hot-brick infrared countermeasures set. You can see the set attached to the aft section of the aircraft drop tank.

The contractor performed many engineering tests of this device. By monitoring contractor testing and not duplicating the tests at one of our installations, several months of testing were eliminated. Further, use of contractor testing data eliminated need of at least two prototypes.

Now what about some examples of outstanding programs under SIDTC? In the XM-1 Tank Program, for example, the time between advance development contract award up to the DSARC (Defense Systems Acquisition Review Council) was 40 months. Total government development testing time was 2 1/3 months, or 6 percent of the elapsed time. Total TECOM test cost was about 1½ percent of the program budget.

The test design plan for the upcoming DT II phase of the XM-1 next year was structured to take maximum advantage of previously obtained data from the contractor and DT/OT 1. If the advanced prototype system has reached its potential for the next test period, test time should be less than that expended for any recently produced evolution of the M60 tanks.

Another example of a well-executed program is UTTAS (Utility Tactical Transport Aircraft System). The time required for engineering development up to the DSARC decision was 52 months. Total time for government testing was 7 months, 14 percent of the elapsed time. Total TECOM estimated test cost was less than one percent of the total program budget.

Use of contractor and OT data, especially stability of design, enabled

testing to be reduced significantly. As a matter of fact, with the decision to go into full-scale production and deployment, there may be no DT/OT III conducted on this system.

The Stinger, which is a shoulder-fired air-defense infrared weapon system, is the planned replacement for the older Redeye. In terms of development time, we anticipate the Stinger will be fielded in about one- third less time. The number of missiles fired to test the Stinger was two- thirds less than required for Redeye, resulting in substantial savings.

Besides managing our programs more effectively, we are also managing our facilities better. For the last two years, TECOM has been preparing a Test Facilities Register that will consist of two volumes. Volume 1, which was published in May of last year, describes the significant testing capabilities of 29 DARCOM installations and test facilities, and those items valued in excess of $50,000. We have distributed about 1,200 copies to the DARCOM community, some DoD agencies, and several contractors.

We are currently updating Volume 1 to include annexes which will describe some 40 other DoD test facilities as well as some 60 contractor facilities that have provided test support to the Army in the last five years. Volume II will be an automated data bank of information on test equipment and instrumentation (each costing) in excess of $10,000.

Any company that wants a copy of Volume 1 need only indicate name and address on the sign-up sheet and copies will be forwarded. Available also is a brochure prepared by my command, "Industry Use of Army Test Facilities." It consists of an overview of TECOM and provides information on how to go about utilizing our facilities.

It is evident that there has been definite progress. But there is still too much testing of all types by everyone in the development community. Much of it is redundant and duplicatory. We must define test requirements earlier and in the RFPs (Requests for Proposals) and contracts.

Further, there must be community agreement on standards to be used; also, failure definitions and data to be recorded. Then data starting with contractor and developer tests must be usable by the DT and OT testers for a data base and RAM (Reliability, Availability and Maintainability). Next, the evaluators must be able to use this data for their important task. This is the most effective way we are going to balance that scale.

The expression, "Tomorrow is yesterday," is certainly true for test and evaluation. A good crystal ball would help, but I think testing indicators are relatively clear. The future posture of testing will be influenced by key provisions in Army Regulation 1000-2, some of which are:

". . . The intent . . . is to eliminate repeated heel-to-toe development and test cycles which . . . prolong programs . . . contribute to technological obsolescence and increase cost . . . . Separate contractor and operational tests should be combined . . . (if) benefits can thereby be accrued . . . . Passage from one phase to another will occur only when all essential prespecified milestones have been satisfactorily accomplished . . . ."

There is much concurrency allowed here. But note that there should be no relaxation of a rigorous, disciplined approach that follows the agreed upon test design. Testing tomorrow will provide us with a more flexible policy that will permit use of the most effective test strategy. Complicating this will be new standardization and interoperability requirements.

The full impact of this remains to be seen. The Army and industry really have the opportunity to work toward a shorter development cycle, with less test time - if we can get together and make it happen.

The foundation being poured for tomorrow will stress flexibility in testing, and independent evaluation. The main emphasis will be on DT/OT II to assure we have a mature prototype to go into full-scale production.

DT/OT III will be the exception, thereby reducing the life cycle and making possible earlier fielding of equipment. We have found that, when a program has been carefully planned and requirements remain stable, a mature prototype design usually is available for validation testing.

Once that prototype is ready, the time and cost of government tests are relatively minor in terms of the total program. However, good test results are still the most fundamental measure of whether a system should progress to the next phase.

Looking toward tomorrow, we hope to eliminate much duplicatory and redundant testing and strive for an earlier IOC (Initial Operational Capability). I believe we will have a better balance, with reductions in time and costs if we continue to improve - among others—our test methodology, instrumentation, and simulation techniques.

The XM1, UTTAS and Stinger programs (as I discussed them earlier) demonstrate how effective an Army/Industry testing partnership can be. The goals of the Army and industry are certainly compatible. We can provide needed systems on a cost-effective, timely baseline if we all truly implement SIDTC and AR 1000-2.

Note that I said the Army T&E Community wants to work closely with you. In the past, the relationship of the developer side with government testers was often abrasive, so that we were sometimes at odds. That situation should be improved now. Nevertheless, it is important that testers and evaluators stand their ground in the face of those who advocate a relaxation of adherence to critical test standards . . . .

Here are some of the partnership actions I would recommend. Early integration of test design requires coordination of test requirements at the RFP (Requirements for Proposals) phase, as I mentioned before. Common definition of test standards and RAM criteria are essential. Standard failure definitions have always been a problem. This is the most significant action of all.

We must continue to work together to improve the realism of testing. Military test standards that reflect the operational environment should be used in developmental testing. Common understanding and application of current policies and directives will permit us to respond to Congressional guidance and do a better job of weapon acquisition.

Congress will support us if we provide sound assessments of our requirements and keep them informed of progress in materiel acquisition. In fact, it is incumbent upon the entire development community to pass on the good news as well as the bad, as soon as we can. I believe we can agree that adequate testing is a necessary ingredient of the development cycle. We cannot tolerate critical weapon failures in training or in combat. So we must do a thorough test job.

But how much is enough? That may never be answered properly to satisfy any audience. Even last week's issue of TIME magazine could not answer the same question as it pertained to national defense. Detroit's industrial community apparently has difficulty answering the question - judging by the recall of passenger cars with RAM and design problems.

We are taking measures to restrict testing to that which is necessary to assure valid conclusions with the most economical expenditure of funds and time. SIDTC, plus the flexibility of AR 1000-2, appears to be saving some time and money, but competing requirements can always do us in.

Congress often changes direction, as does the Office of the Secretary of Defense. The user too often changes his requirements, or perhaps later defines them more fully in terms of operational and logistical needs. Design problems necessitate rework and require schedule changes.

Still I am confident that by using the initiatives in new policies, our combined test experience, good technical judgment, and following through with partnership actions, we can achieve a leg-up on the cycle.

We are testing more effectively and, in some cases, more economically. We are more acutely aware of the importance of independent evaluation and stringent testing in the operational environment. These certainly are pluses. I believe we are on the right track, taking a shorter route toward the all-important initial operational capability date.

Let me leave you with this - today there is still too much T&E by everyone in the development community, too much duplication and redundancy. As partners, let's hang in there and increase those time and cost reductions. That much testing IS enough!

19th International Mathematical Olympiad . . .

USA Team Wins Over 20 Nations

Selected competitively from more than 400,000 high school students to represent the United States in the 19th International Mathematical Olympiad in Belgrade, Yugoslavia, July 5-6, an 8-man team emerged victorious over teams from 20 other nations.

The Russian team finished 10 points behind and third place was shared by Great Britain and Hungary. The Netherlands team was fourth. Entered in the Olympiad for the first time in 1974, the U.S. team finished second and was third in the 1975 and 1976 competition.

Members of the winning team (shown above, l. to r.) are Randall Dougherty, Fairfax, VA; Mark Kleiman, Staten Island, NY; Victor Milenkovic, Glencoe, IL; Peter Shor, Mill Valley, CA; Ronald Kaminsky, Albany, NY; Michael Larsen, Lexington, MA; James Propp, Great Neck, NY; and Paul Weiss, Brooklyn, NY.

The U.S. Army Research Office, Research Triangle Park, NC, with Don Rollins, chief of the Conferences and Symposia staff, serving as project officer, funded the team's travel as well as board and lodging during a 3-week training session at the United States Military Academy. Seventeen additional finalists also participated in the USMA training.

Cooperating in the training program were COL (Prof.) Jack M. Pollin, head of the Mathematics Department, aided by MAJ Norman O' Meara and MAJ Anthony F. Quattromani. Coaches of the team were Dr. Samuel L. Greitzer, professor of mathematics emeritus at Rutgers University, and Dr. Murray S. Klamkin, professor of mathematics, University of Alberta, Canada.

Credited with developing the International Mathematics Olympiad in 1959 is Rumania, the winner that year in competition with Bulgaria, Czechoslovakia, Poland, German Democratic Republic, and Soviet Union.

The United States has conducted mathematics competitions for high school students since 1950. The idea of a U.S. Mathematical Olympiad was spawned in 1971 when Prof. Nura D. Turner of SUNY (State University of New York), Albany, authored an article in the *American Mathematical Monthly* that led in 1972 to the USA Mathematical Olympiad.

ISEF Army Superior Award winners, flanked by ARO Commander Anthony P. Simkus (left) and COL Aubrey F. Messing, ODCSRDA, include Teresa Frizzell, Neil E. Goodman, John D. Hayes, Richard A. Sanger, Dean P. Chang, Paul M. Embree, Linda Jeanne Colby, Wesley Alden, W. H. Cork, Richard H. Ebright and Tony M. Brewer.

28th International Science & Engineering Fair . . .

Army Judges Select 22 Winners for Summer Jobs, Trips Abroad

Department of the Army judges selected 22 Superior and Meritorious Achievement Award winners from more than 400 finalists in the 28th annual International Science and Engineering Fair (ISEF), in Cleveland, OH.

Secretary of the Army Clifford L. Alexander, Jr. signed Certificates of Achievement presented by Army Research Office Commander COL Anthony P. Simkus to each of the Army winners, along with a gold or silver medallion.

Among Army superior award winners were Paul M. Embree, chosen for the annual "Operation Cherry Blossom" free trip to the Japan Student Science Awards Exhibit in Tokyo next January, and John Dodge Hayes, who will attend the London International Youth Science Fortnight, July 27-Aug. 10.

The Association of the U.S. Army (AUSA) contributed $100 checks to selectees for the Japan and London trips. Superior award winners received an offer for a one-week expense-paid visit or summer employment working with scientists in an Army laboratory.

Sponsored by Science Service, a nonprofit institution whose objective is to stimulate interest in scientific research, the ISEF culminates competition among high school students in more than 200 affiliated local, state and regional fairs, including some in foreign lands, i.e., Canada, Japan, Puerto Rico and Sweden.

Exhibits of the student research were representative of the behavioral and social sciences, biochemistry, botany, chemistry, earth and space sciences, engineering, mathematics and computers, medicine and health, microbiology, physics.

Operation Cherry Blossom was initiated in 1963 by the Army, Navy and Air Force, in cooperation with the Japanese newspaper *Yomiuri Shimbun.* The Air Force discontinued sponsoring a student to Japan in 1972.

The Army and Navy this year each selected a student for the Japan trip and joined in sponsoring one winner each to join five 15th National Junior Science and Humanities Symposium (NJSHS) winners at the International Youth Science Fortnight (IYSF).

John Dodge Hayes, 17, Preston (NM) Fountain H.S., was selected by the Army to attend the IYSF for his exhibit "Cyclic Systems: A New Self-Oscillating, Auto-Catalytic System." Alternate *Wesley Alden,* 17, Southeast H.S., Wichita, KS, was chosen for "*In vitro* Interactions of Hormone Receptor Sites on Normal and Malignant Cells."

David S. Mark, 18, Nicolet H.S., Milwaukee, WI, IYSF winner was chosen for Navy "Method of Kidney Dialysis Using Electronically Regulated Electrophoresis." Navy alternate is *Michael H. Lev,* 16, Stuyvesant H.S., Brooklyn, NY, for "Various Properties of n-Dimensional Space and What Other Polyhedra are Possible in Other Dimensions."

Operation Cherry Blossom. The Army winner is *Paul M. Embree,* 17, Muhlenberg H.S., S. Temple, PA, for "Coherent Detection as a Means of Reducing AM Radio Distortion." Army alternate is *William H. Cork,* 17, Kentucky (Louisville) County Day School, for "Bacteria Which Degrade Hydrocarbons."

Selected by a panel of 19 Naval Research Reserve judges, independent of the ISEF, *Richard A. Sanger,* 17, Coronado (CA) H.S., exhibited "Rhomboid Ripples: Diamonds on the Beach." Richard also was an Army Superior Award winner. Navy alternate is *Randall C. Elliott,* 16, Duncan (OK) H.S., for "A Solar Fluidine Heat Engine."

Army Superior Award Winners also include *Teresa Frizzell,* 17, Cloudcroft (NM) H.S., for "Drugs and the Perfect Weaver"; *Neil E. Goodman,* 17, Walnut Ridge H.S., Columbus, OH, for "Biomedical Applications of an Organically Deprived Trypsin Inhibitor Protein in the Treatment of Renal Insufficiency"; and

Dean P. Chang, 16, Hiram W. Johnson H.S., Sacramento, CA, for "Antibiotics From Algae"; *Linda Jeanne Colby,* 18, Colonial Beach (VA) H.S., for "A New Approach to an Ancient Triangular Array"; *Tony M. Brewer,* 18, East Noble H.S. Kendalville, IN, for "Glottal Wave Form"; *Richard H. Ebright,* 17, Muhlenberg H.S., South Temple, PA, for "Discovery and Isolation of a Phopaloceran Growth Hormone."

Army Meritorious Awards went to *Coleen Truax,* 17, Wooster H.S., Reno, NV, for "Some Biological Effects of Organic Mercury Administered Topically and Orally"; *Paul J. Maddon,* 17, Martin Van Buren H.S., Queens Village, NY, for "Phenotypic, Enzymatic, and Genetic Aspects of the Rosy Mutant"; and

Michael P. Guymon, 18, Ogden (UT) H.S., for "Terpenoid Analysis and Effects of the Genus *Juniperus*"; *Richard C. Schirato,* 18, Skyline H.S., Dallas, TX, for "Effects of Solvents on Selected Exciplexes"; *Wayne R. Moyle,* 18, Bonneville H.S., Ogden, UT, for "Effect of Breakwaters on Erosional Shorelines"; and

William D. Walker, 17, Willow Glen H.S., San Jose, CA, for "Utilizing Magnus Effect for STOL (Short Take-Off and Landing)"; *James Theiler,* 17, Sandia H.S., Albuquerque, NM, for "Analytic Approximation Techniques for Ordinary Differential Equations"; *Nanda Victornie Duhe,* 16, Cy-Fair H.S., Houston, TX, for "Detoxification of Poison Ivy Urushiol"; and

Jerry Jay Jackson, 17, Rockledge (FL) H.S., for "Analysis of Chemotherapy Compounds on Cancer and Normal Cells"; *George M. Greene,* 18, Northwest H.S., Omaha, NB, for "Effects of Temperature on the Pitch of a Stretched String"; and *Nicole VanDerHeyden,* 17, Murray (UT) H.S., for "Lethal Ear-Tuft Trait in Araucana Fowl."

U.S. Army participation in the ISEF is arranged by the U.S. Army Research Office (ARO), Research Triangle Park, NC. Anne G. Taylor was ARO action officer. Dr. Gordon L. Bushey, U.S. Army Materiel Development and Readiness Command (DARCOM), was chairman of the Army judges panel.

ISEF Army Panel of Judges. Back row (l. to r.) LTC Gerald H. Elkan, CPT Henry E. Bass, MAJ Cyrus M. York, CPT Eric J. Norman, Dr. Grant Gerhart, Edward S. Bender, Dr. George D. Ashton, CPT Lamont W. Law, MAJ Ronald D. Stricklett, LTC Harold Zallen, MAJ Salvadore L. Camacho. Middle row: Dr. Robert G. Ahlvin, CPT Kenneth A. Zych, Dr. K. H. Steinbach, Leon Leskowitz, Dr. Ralph E. Dusek, MAJ James V. Mengenhauser, Dr. W. E. Fisher, COL Aubrey F. Messing, Dr. Charles E. Williamson. Front row: MAJ States M. McCarter, MAJ John D. LaMothe, LTC John R. Montgomery, Anne G. Taylor, COL Anthony P. Simkus, Bonnie J. Wiley, Dr. Gordon L. Bushey, COL Robert E. Long and MAJ John A. Replogle.

Speaking On . . . *(Continued from inside front cover)*

I have talked about how we think about defense spending, how we talk about defense spending and how we look at defense spending, all of which has a major impact on communicating with the American people. I have only hit the peaks of waves in those three areas.

There is another approach to defense spending that is being suggested from several quarters. Essentially, this approach recommends that we place all of our interests on one side of the balance scale - the protection of the home land, the protection of national interests in the world, the preservation of American freedom of action.

On the other side of the scale, we place the forces necessary to bring that scale into balance. Our interests in Western Europe, for example, would be balanced by the forces we have committed in NATO. Our interests in protecting our homeland would be balanced by the Strategic Nuclear Triad and by the required conventional forces.

This balancing would continue from items essential to our security and well-being to those of only marginal interest. Now if this approach were followed, it has the advantage of weighing our interests against the costs of maintaining those interests.

We could then talk about defense spending versus national returns. Is it or is it not of particular interest? Is or is not that particular interest worth the cost in terms of military forces? It would also allow us to look at defense spending in its true light - the contribution such spending makes to the security and well-being of the American people.

Balancing our interests with the forces necessary to preserve those interests would provide a point of view with which to explain to the American people the need for adequate funds for our national defense, and perhaps might even improve past performance in this area.

But at this juncture I just want to seek your help in getting that story across so that we do have a prepared United States. I just want you to know that those of us who have the privilege to serve as the Chiefs of our Service are dedicated to pursue as diligently as we can, within the resources made available, the preparedness of this country.

Now let me tick off some concerns in the Army and defense industries mutual area of interest. I want to tick them off in terms of questions I think are germane to this group.

One of my concerns is, are we in the Army exploiting to the fullest the scientific and technological capacity, capability and knowledge of the industrial, scientific and technological communities of our nation as we project in the future about how we fight and with what?

In other words, are we in the Army, in fact, picking the brains out there in industry, and in the scientific communities? Are we picking the brains and exploiting all that is going on out there to the benefit of our Army? Second, are we tending to make our weaponry and our combat vehicles too sophisticated and too complex for today's soldier who must man and maintain that equipment?

Third, if the total manpower costs continue to absorb the largest share of constrained budgets, how can we reduce equipment costs so as to increase procurement? Fourth, are we spending too much time developing, testing, and evaluating new equipment rather than improving a proven product? The last question is, how can we reduce the time it requires to get a piece of equipment off the drawing board and into the hands of the soldiers?

Those five questions represent concerns that are in our mutual area. There are others but I won't mention them. We don't have the answers but we need them and we need help; we need help from you in our search for those answers.

Those are the two points I wanted to make. Help us out in getting the story across, and help us find answers to those five questions which represent concerns that are in our mutual area. There are others but I won't mention them.

Those are the two points I wanted to make. Help up out in getting the story across, and help us find answers to those five questions.

A New Direction in the Acquisition Process

Deputy Assistant Secretary of Defense (Materiel Acquisition) Jacques S. Gansler's address follows: Today, I would like to ask you to think of an over-all Defense acquisition process from a different perspective than that to which we have all become accustomed. As you know, during the last 10 years major efforts have been made to try to get a handle on weapons systems acquisition costs and risks.

In my opinion, there has been considerable success in *both* areas. However, I am concerned that our approach to solving each of the individual problems that arose was perhaps too "piecemeal." We addressed each problem with a "tailored solution" which, in fact, did tend to reduce cost in that area and did frequently reduce the risk at the same time.

In my judgment,, it is time to step back and assess the *over-all* acquisition process again, since I fear that what we have done is to "sub-optimize" in many compartmentalized areas, while not recognizing the inherent conflicts and contradictions between and among each of these selected areas. The net effect, I fear, has been the current very long and very expensive over-all process, from initiation of a program to weapon deployment.

Over the past couple of years we have begun to recognize some of the inherent conflicts in the acquisition process, and to take some corrective actions. Let me illustrate a few of these. For example, in the past we used to emphasize performance and development costs as the driving factors in weapons systems acquisition. When we were done, we then found that we had developed systems which were too expensive to produce in the necessary quantities, or too sophisticated and complex to support in the field.

The design-to-cost effort recognizes the need for designing-in producibility at low cost, while at the same time embracing reduced operating and support costs goals. However, there is still the inherent conflict between minimizing operating and support costs and maximizing readiness. There is essentially little done in the development cycle today to explicitly address materiel readiness.

Thus, what is needed, and what we have recently begun to achieve, is an integration of a production and support *perspective* into the weapon system development phase of our programs. Clearly, this is *not* a case of giving something to everyone. For, in fact, tradeoffs must be made in order to achieve our Defense objectives within the available resources. The last few percent of performance may have to be sacrificed for reduced production and support cost or improved readiness.

If one were to step back and look at the total acquisition cycle and the changes that have been brought about over the past 10 years, one could say that we have largely eliminated concurrency and we have taken significant steps towards reducing risks. However, we have *added* "incremental decision making," increased management reviews, considerable increased test and evaluation, competitive prototyping, low-rate initial production, etc.

Each of these additions had the desired effect, but they have also greatly increased the acquisition cycle time and cost. We have not removed anything! The effect of this has been that where we were able to field the Nike Ajax in 6 years and the Hawk in 5 years, from requirement to deployment it is likely to take 19 years for the Patriot and 18 years for AEGIS.

Finding ways to compress the cycle without increased concurrency or risks is, I believe, one of our most difficult challenges for the near future.

In my opinion, there are two major conceptual approaches which should be taken to address this problem. First, I believe we need to do much more early planning of the whole acquisition cycle. This includes, not only the normal development cycle process; it includes the planning of alternatives, decision options, deviations from normal practices, acquisition strategies, industrial base impacts, production, maintenance, etc.

It includes considerably more "what if" planning, such that when an event occurs we don't wait 6 to 9 months for the decision-makers to evolve a plan for the next step. It also includes far more key decision points during the cycle, so that if significant achievements can be realized earlier, or problems develop during early testing, new directions can be taken to minimize costs and time.

Secondly, I believe that far too much has been made of the *differences* between Defense acquisitions and commercial practices. In my opinion, a move in the direction of far more similarity would be extremely beneficial to the Department of Defense. The steps that we have taken over the past two or three years are, in my judgment, steps in the direction of bringing military and commercial practices closer together.

Let me briefly cover some of these so that you can see some of the actions which we have already taken in this direction, and so that we can establish a better reference for my subsequent discussion on additional steps which are still needed in order to address specifically the question of how to shorten the acquisition cycle.

Integration of Development and Production Planning. Since about 70 percent of our total weapon system acquisition and support costs is essentially determined during the conceptual stages of equipment development, it is imperative that we focus the kind of attention necessary at the front end of the process to reduce these "downstream costs." I intend to hit just the highlights of some of our ongoing initiatives, and I will be happy to elaborate on any of them during the panel session, if you have questions.

First, we are giving more attention to the initial stages of the acquisition process. As directed by OMB Circular A-109, we are evaluating the mission need more critically and considering a wider range of available technologies to meet that need, quickly and efficiently - both in terms of performance and life-cycle costs.

One of our major initiatives is to improve and strengthen our in-house production planning. It is ironic in a sense that although our production

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account varies between 65 and 80 percent of acquisition cost, in many cases the production community has no involvement until the majority of parameters that influence these costs is already determined.

The production community must involve itself earlier in the systems acquisition process, to ease the transition from development into production and help reduce total costs. To accomplish this, we are stressing production planning assessments early in the development cycle, and urging early identification of manufacturing technology voids to aid the transition process.

In addition, we are looking more to prototype *competition* for technological innovation—to obtain performance improvements, cost reduction and risk avoidance. I think we can use this tool even more efficiently than we have to date. Significant, qualitative improvements from innovation are more likely to be found in the prototype development phase than during competitive production, where only quantitative changes are likely.

Design-to-cost is one of the commercial product management tools we are using to help integrate the development and production phases. The concepts of design to unit production cost and design to minimum life-cycle cost are becoming institutionalized—with goals being established for both parameters early in the development cycle.

Design-to-cost techniques have contributed to reducing the rate of non-inflation cost growth of systems, as identified in our SAR (Study and Review) reports to Congress, from over 6 percent per year in 1973, when we were just getting started, to around 3 percent today. Our challenge is to keep moving in this positive direction as we build more flexibility and visibility into the management process.

The new Source Selection Directive is a major step in the direction of lower cost systems. It says that we will make development awards based upon the inherent production and support cost of the proposed system—not primarily on the proposed development program cost.

Even though we in the Department of Defense have the responsibility to provide the "requirements" framework for our new systems, we cannot tie industry's hands if we truly want lower cost systems. We want—even during the bidding process—RFP and contract changes recommended to us that will be cost-effective. The new Source Selection Directive also takes a step in this direction.

A chronic complaint from industry has been that over-application of military specifications and standards is driving costs up. Therefore, a major effort is presently under way to review all of our 40,000+ specifications and standards. The goal is to eliminate those which are unnecessary and update those which need it; but, most important, to allow and encourage "tailoring" to individual program requirements.

Rather than starting by issuing directives that dictate the "scrubbing" of RFPs (Requests for Proposals) and the "tailoring" of specifications and standards, we began by performing a considerable amount of missionary work in this area. As a result, major programs such as HELLFIRE, the Navy Electronics Warfare Suite, and the F-18 have already tailored various requirements.

Our objective is to get the Services to cause the necessary "cultural change" to take place, and I believe we have made a good start. The Services have issued some good "implementors." Based upon these efforts and other "lessons learned," we have just issued an over-all "scrubbing and tailoring" policy in the new DoD directive 4120.21.

I want to just mention some of the other initiatives for which we are issuing new policy guidance—adoption of commercial specifications, greater use of commercial equipment, product warranties, software standardization and revitalization of the Value Engineering program.

Complementing these cost-reduction efforts are actions designed to improve the efficiency of our production process. We need to emphasize manufacturing technology early, in concert with over-all front-end production planning to also help bridge the gap between development and production.

The Manufacturing Technology Program has been redirected to first identifying production cost drivers which need attention; then to provide "seed money" to assist industry in developing innovative, and less costly, Defense production methods. Our annual funding in this area is being doubled—to over $200 million. A recent success story in this area is the GAU 8 ammunition—through a $3 million investment in a new manufacturing process, we were able to avoid $300 million in production costs.

Another area we must attack is the obsolescence of plants and equipment in the Defense industry. As a result of the "Profit 76" study, we have revised our profit policy to reward needed investment by making the imputed interest cost of facilities an allowable cost for the first time.

We also have changed the weighted guidelines to provide increased profit based on company capital investment. Concurrently, we are working on other investment incentives that would encourage industrial modernization, such as greater use of multiyear contracting and special termination provisions to reduce risk.

If we are to move in the direction of commercial practices, we must reduce our day-to-day involvement in the contractor's activities. As a step in this direction, we are removing almost 3,900 people, who performed quality and contract administration functions, from contractor plants.

On the industrial base side, the idea of compartmentalizing, or suboptimizing, applies equally well. Our past approach to conducting business with the Defense Industry has been to focus attention on specific cost elements at the prime contractor level. As a result, we have developed a "dual economy," with differing market characteristics at the prime contractor and the subcontractor/parts-supplier levels.

For example, we recently completed a joint DoD/OMB (Department of Defense/Office of Manpower and Budget) study of the U.S. aircraft industry. The chief findings were that this industry, at the prime contractor level, is operating at about 55 percent of its one-shift capacity, and that the cost of the idle capacity was conservatively costing the Defense Department on the order of $400 million a year.

Similarly, it was found that the "bottlenecks" for production "surge" rest primarily at the part-supplier level—and this base is shrinking rapidly. We have initiated corrective actions at both levels. The main point I want to make is that we are taking this broader perspective.

Similarly, where we previously attempted to optimize the development timing and production rate for *each* program, we are now looking at the over-all industry sector and firm impacts, and considering program timing and labor stability (e.g., the "constant work force" concept).

Early Operating and Support Planning. Now, I would like to turn to the conflicts and challenges we face in trying to minimize the cost to operate and support our equipments while improving force readiness.

I am sure that you all have been made aware of the trends regarding the DoD procurement account. In the decade since the Vietnam peak, Defense buying power has experienced a drastic erosion, going from a high in 1968 of $47 billion in outlays (in constant 77 dollars) to approximately $28 billion this year, having bottomed out in 1975 at about $17 billion.

Over that same period of time, we have experienced a significant growth in the share of the budget going for operations and support. However, even with this cost growth, we are still experiencing readiness problems. Even Congressional interest in the readiness of our military forces has picked up considerably over the past few months. We are trying to do something about readiness, as well as simultaneously reducing the fraction of the DoD budget allocated to operating and support costs—a tough challenge!

As a little background, DoD spends approximately $14 billion annually to buy spares and consumables to support our operational forces. Even though Secretary (of Defense) Brown's amended FY 78 budget called for a net $2.8 billion reduction in other areas, we added back in more than $600 million for readiness improvements. But this approach alone cannot solve our problems. Our long-term strategy must get us back in the position where procurement constitutes a larger percentage of the budget than operations.

We are working hard to get the parameters which impact readiness and associated operating and support costs defined early in the development cycle. From this, we can develop a cost-effective set of equipment design and logistics support alternatives consistent with our readiness goals.

We are looking at contracting approaches—e.g., warranties—to help make reliability and maintainability improvements happen. Clearly, follow-up is required to make sure we are meeting our goals. We may need a radically new approach—a feedback or tracking mechanism that follows the equipment into deployment.

Shortening the Acquisition Cycle. Now, let's return to the over-all acquisition cycle. While technological advances are occurring at a more rapid rate—as evidenced, for example, by the new families of tactical missile guidance schemes—our acquisition cycle is unnecessarily stretching. We can point to programs such as Lance and Television Maverick which were speedily concluded in about four years. Today we look at programs such as COPPERHEAD and HARPOON which may exceed eight years. We need to look closely to reverse this trend, without increased risk.

Historically, we have found that the length of the acquisition cycle has been perturbated by two things. First, we are not in agreement on what we want and second, we tend to bite off a larger technological chunk than we are capable of digesting. I think Circular A-109 forces us to resolve the first, and Secretary Brown's recent policy statements emphasizing simplicity and reliability as weapon goals requires us to face squarely the second. But given these two steps, we now have to revise the decision process to take advantage of the potential for more rapid developments.

The risk, cost, performance and schedule tradeoffs required by the acquisition management process are difficult to make, at best. However, I personally feel that there are some definite steps we can take to achieve a better tradeoff balance, without undoing the positive things we have accomplished to date.

First, we can adopt a "hands-off" approach during development for programs which do not have a high degree of technical risk. To make this work, two things have to happen. First, we need to provide a requirements description, and a test plan, of what we want, but exclude the "how-to-design" specifications. Second, we need a healthy competitive environment to get innovative ideas, and to offset some of DoD's risk.

The acquisition cycle benefits from reduced day-to-day management, and our suppliers have the flexibility to plan their programs in the most time-efficient manner. We are trying this approach now on the Air Defense Gun. Next, I believe we are seeing far too many programs presented to us for management approval which incorporate very high-risk subsystems. This provides the framework for a vicious cycle of test and redesign between these subsystems and their carrier vehicles.

Basically, what we need is more independent feasibility demonstration of new components and new technology which will develop more options for our weapon systems. As a result, we should actually do *less* full-scale weapon system development. We have also found that when technology is fully demonstrated, and then applied to a new system or a product improvement, our costs were almost half.

In the last few years, for programs involving major technological advancements or uncertainty in operational acceptability, it has become normal practice to develop and test hardware prototypes prior to entering full-scale engineering development—the A-10, F-16, XM-1 tank, HARM and Imaging Infrared Maverick are examples.

However, I think we should consider ways to make more efficient use of prototypes. Obviously, if there are no technology advancements to be addressed, prototypes are not required. But, if we use them, we should do so in a manner to reduce the full-scale development phase. We should consider the incremental addition of system requirements and demonstration objectives as the prototypes become stronger candidates to fill a particular mission need. We can help shorten the over-all cycle with these incremental additions, by not having to repeat successful tests or start from scratch in the full-scale development phase.

Our prototype programs are structured as low-cost programs— minimum drawings, modified qualification, etc. As the prototype program evolves into a major contender, we can modify our development activities, institute production planning and producibility analysis—and possibly be able to skip full-scale engineering development and enter a low-level production phase.

Another fertile area for possible time savings is that which we allocate for test and evaluation. We all recognize that the earlier we begin testing, the better off we are; we find problems at a point in time when they can be solved with less cost and schedule impacts.

Many of our programs today have separate and distinct contractor, developer and user test phases. Blending, or at least sharing, of test data can have obvious beneficial effects. This should still in no way reduce the independence of test and evaluation, but it may save significant time.

Another area we are looking at to achieve time compression is part of our Manufacturing Technology Program; i.e., Computer Aided Design (CAD). The automotive industry tells us that CAD has reduced the development time for its cars from over two years down to five months. They believe that design changes using CAD can be made relatively risk free.

The transition from CAD to Computer Aided Manufacturing (CAM), using the same software, also contributes to a greatly reduced over-all cycle. The CAD/CAM arrangement lets us go directly from development into production. The challenge is ours, to see if we can share some of the CAD/CAM potential benefits in the Defense Industry.

An obvious shortcut in the acquisition process, and at low risk, is through improvements to already existing equipment. Improved HAWK was a good step in this direction, as well as the new seekers for our air-to-air and air-to-ground missile series. We may, in the future, be forced to this approach for fiscal reasons as much as for our desire to field a capability sooner.

NATO standardization is being given top priority attention. Here, our objectives are to improve force interoperability, make better use of total allied resources, and lower costs of development, acquisition and logistics support. Our allies have made it clear that if standardization is to really work, it must not simply be everyone purchasing the U.S. systems. They want the U.S. to be open to purchasing their weapons.

Our policy is consistent with the desires of our NATO allies. We will buy their weapons when they meet our needs, are cost-effective, and will foster interoperability and standardization. Standardization through the use of "off the shelf" foreign system offers both time- and cost-saving possibilities—if it is done right!

We are also, with a gentle nudge from legislation such as the Culver-Nunn Amendment, considering codevelopment programs to achieve NATO standardization. The point I want to make here is that a joint development program with our NATO allies could have reduced the acquisition cycle for joint programs such as Roland and AWACS. We could have avoided the second development iteration evident in both cases.

The last thought I want to leave with you on shortening the acquisition cycle, and the one we are just starting to address, is the concept of "parallel decision making." Here, the idea is to have status monitoring of periodic and significant events and to issue incremental decisions—often based on "what ifs." We can reduce the cycle length and the risk by periodic releases, rather than waiting for major milestones which can be years apart. This would also eliminate the six to nine months it often takes for the decision making at these "gates."

We could, I believe, have this all planned out well in advance, so the incremental decisions and releases would be consistent with options contained in the long-range plans. We are struggling with the "hows" of making this idea work. We earnestly solicit your help and views.

There is no easy "cook book" solution to obtaining a good balance between risk, performance, cost and schedule in our acquisition programs. To shorten the acquisition cycle, I would suggest we consider a variety of things; among these I would include:

Possible organizational changes to get our thoughts on a more aggregated level; a reconsideration of our decision-making process toward more, pre-planned, incremental decision points; changes in our contractual procedures to provide the stimulus for our suppliers to get us the best product in the shortest time; and thorough front-end planning to tie the process together.

In summary. I believe we have been approaching the acquisition process in too much of a piecemeal fashion. Two very broad, but necessary, actions can help us to bring the total acquisition process back into a proper perspective. First, we must—through our front-end planning— take a more encompassing view toward optimizing the *complete* cycle. This forces a recognition of conflicts between sub-elements and promotes effective early tradeoffs.

Second, we must apply broad policies and procedures which are more consistent with commercial practices—e.g., design- to-cost, "hands-off" competition, warranties and "tailoring" of specifications. Our problem is to translate these broad policies into workable, contractual agreements between the DoD and its industrial suppliers.

I have tried today to provide you with some thoughts on our initiatives to improve the acquisition process. I have also provided you with some of my own ides on how we might reduce an excessively lengthy acquisition cycle, without increased program risk. This is the challenge I want to leave with you—to help us solidify our thoughts into workable concepts and then to help us implement them.

Conferences & Symposia . . .

Smoke/Obscurants Joint Effort . . .

Army PM Draws Views of Other Services

Army, Air Force, Navy and Marine Corps participants contributed to the success of a Smoke/Obscurants Symposium programed as the first of its kind to coordinate an Armywide effort for test and evaluation of electro-optical systems in simulated battlefield smoke environments.

Army Project Manager for Smoke/Obscurants COL Henry R. Shelton convened the symposium at the Harry Diamond Laboratories, Adelphi, MD, under sponsorship of the U.S. Army Materiel Development and Readiness Command. More than 125 representatives of the smoke, meteorological, electro-optical, test, intelligence and user elements contributed to achieving symposium goals.

Among the objectives were: Identify the potential countermeasures threat which smoke represents to electro-optical (E/O) systems developers; present problems in the Army's ability to test and evaluate E/O systems in smoke; establish policies and areas of responsibility for the Army project manager for smoke in coordinating tests of E/O systems.

Formal presentations during the first day were grouped in the following categories: Identification of the Smoke Threat; Effects of Smoke on E/O Systems; Smoke/EO Test and Evaluation; and the Roles of the PM-Office vis-a-vis the Army Training and Doctrine Command (TRADOC).

The second day involved four separate work sessions wherein panel members addressed TRADOC/DARCOM interface requirements; effectiveness evaluation; testing methodology and standardization; and coordination involving TRADOC, Army PM-Smoke, and system developers.

The symposium generated interactions and dialogue for better understanding of the centralized smoke test management responsibilities assigned to the PM-Smoke. Among the important conclusions were:

- Soviet smokes are essentially comparable to U.S. standard smokes, making it possible to obtain a relative comparison of the U.S. E/O equipment against a postulated Soviet threat by testing it with U.S. smokes.
- Variations of effectiveness of E/O systems have been encountered while testing in smoke environments in the open, due to differences in meteorological conditions. Thus, atmospheric conditions frequently exist on the battlefield where significant degradation of systems may occur.
- Despite intensive effort devoted to the development of smoke test technology, improvement in methodology and instrumentation is needed.
- Ultimately, all technical data should be integrated into acceptable mathematical modeling efforts. Action has been initiated through the Joint Technical Coordinating Group (JTCG) to validate field test data for use in predictive and force-on-force models.
- A toxicity problem is associated with Army smoke testing and training. The constraint to meet the user, industrial and environmental requirements on toxicity will create an additional burden on developmental and training programs.
- The key to future success of the smoke testing program will be a continuous dialogue and cooperative effort between the developer, under the leadership of the PM-Smoke, and leadership within the user community.

Proceedings of the symposium (classified) have been published and given wide distribution within the Department of Defense.

ADVANCED PLANNING BRIEFING FOR INDUSTRY

TARADCOM Commander MG Oscar C. Decker Jr. and former Assistant Secretary of the Army (R&D) Edward A. Miller.

DARCOM Acting Deputy CG for Materiel Development MG Ira A. Hunt, and COL W. H. Dawson III, TARADCOM DCG

An Advanced Planning Briefing for Industry (APBI) at the Michigan State University Management Education Center, Troy, MI, May 19, provided an overview of U.S. Army plans for current and future vehicle systems and related items.

About 320 high-ranking Department of Defense officials and industrial representatives attended the developer-user meeting. Joint sponsors were the Tank-Automotive R&D Command (TARADCOM), the Tank-Automotive Materiel Readiness Command (TARCOM) and Training and Doctrine Command (TRADOC). TARADCOM and TARCOM are major elements of the U.S. Army Materiel Development and Readiness Command (DARCOM).

MG Frank A. Hinrichs (USA, Ret.), right, director, Technology and Management Advisory Service for American Defense Preparedness Association, presents outstanding government service award to Clifford Bradley, chief TARADCOM Advanced Concept Function.

Principal participants included former Assistant Secretary of the Army (R&D) Edward A. Miller (since succeeded by Dr. Percy Pierre); TARADCOM Commander MG Oscar C. Decker Jr., who gave the welcome address; and then Acting Deputy CG for Materiel Development MG Ira A. Hunt, DARCOM, who keynoted plans for Army vehicle R&D programs.

TARADCOM Chief Scientist Dr. Ernest E. Petrick discussed tank-automotive trends for the future, emphasizing total vehicle system integration; higher power and speeds; dynamic loads and stresses; continued conversion from low to high technology, particularly in weapons subsystems; standardization and interoperability; and increased government/industry communications.

"Projections of Army Materiel Requirements for Vehicles" was discussed by Donald Brennan, chief of the Technical Data Division, TARCOM. COL Edward V. Kelly, chief, Maneuver Division, TRADOC, followed with "Tank/Antitank Weapons Requirement."

Earl Brown and CPT Stanford I. Polonsky Jr., with the Transportation School, Fort Eustis, VA, presented "Tactical Vehicle Study;" MAJ Don W. Derrah, M60 Tank Development Project Manager Office, TARCOM, discussed the "M60 Product Improvement Program."

"Engineering Challenges and Fielded Systems" and "Army Trend Toward Commercially Designed Vehicles" were reviewed by LTC Joseph Milliron, director of Engineering, TARCOM, and deputy Ronald Patek.

Edward Hamparian, chief of TARADCOM's Propulsion Systems Division, presented "Future Trends in Propulsion Systems." Robert Otto, chief, TARADCOM Armor and Components Division, concluded the program with discussion of "Future Trends in Armor and Components." COL Warren T. Palmer, director TARAD Laboratory, made closing remarks.

Atlanta IV Executive Seminar

(Continued from page 22)

Northrop Corp.

Members of the panel were TECOM Commander MG Patrick W. Powers, Aviation Systems Command leader MG Eivind H. Johansen (since promoted to 3-star rank as Army Deputy Chief of Staff for Logistics), Armament Command leader MG Ben Lewis, Tank-Automotive R&D Command leader MG Oscar C. Decker, Electronics Command leader MG John K. Stoner Jr., and Missile Readiness Command leader MG George Turnmeyer.

Panel No. 2 was concerned with the question: Are the Project Managers on Board? Moderated by John H. Richardson, executive vice president, Hughes Aircraft Corp., the panel consisted of BG John Egbert, project manager for Munitions Production Base Modernization; BG Stan Sheridan, PM for MICV (Mechanized Infantry Combat Vehicle); BG Patrick Roddy, PM for Surface-to-Air Hawk Missile; COL Charles Drenz, PM for the Cobra Attack Helicopter; COL James Wyatt, PM for Combat Radio Communications Systems (SINGARS); COL Richard Kenyon, PM for the Utility Tactical Transport Aircraft System (UTTAS); and COL Lawrence Hunt, PM for the Pershing Surface-to-Surface Missile.

Panel No. 3 was devoted to consideration of: Has the "Word" Flowed Down to the Procurement Experts? Dr. Phil Lett, general manager of the Sterling Defense Division, Chrysler Corp., was the moderator. The members were five "journeymen" (grade GS 12 and 13) "rising young professional" procurement experts: John Gerlach, Maureen Cook, Zane Philips, Brenda Kiser and William Street.

Norman R. Augustine, former Under Secretary of the Army and earlier Assistant Secretary of the Army for R&D, now vice president for Technical Operations of Martin Marietta Aerospace, moderated *Panel No. 4.* The topics discussed covered a broad range of areas of materiel acquisition problems. Members were ASA (RDA) Dr. Percy Pierre, ASA (I&L) Alan J. Gibbs, LTG George Sammet Jr., LTG Eugene J. D'Ambrosio and John D. Blanchard.

Closing remarks by LTG Sammet provided him an opportunity to state briefly his views of some of the progress achieved in the Atlanta I, II, III and IV Executive Seminars, his confidence in the success of efforts to improve Army-Industry efforts for national defense, and his appreciation.

Career Programs . . .

Training for Career Advancement . . .

12 Civilians Chosen for Senior Service Schools

Twelve Department of the Army civilian employes representing a broad spectrum of career fields have been selected to attend the 1977-78 academic year at four senior service college. Two have been selected to participate in the 1977-79 Corresponding Studies Course provided by the Army War College.

Selectees were screened by the Department of the Army Executive and Professional Development Committee, including Deputy Assistant Secretaries of the Army for Manpower and Reserve Affairs; Research and Development; Installations and Logistics; and Financial Management. Deputy directors of Civilian Personnel and Military Personnel Management completed the committee. Schools and selectees are:

NATIONAL WAR COLLEGE, Fort McNair, Washington, DC. Along with the Industrial College of the Armed Forces, the NWC comprises the National Defense University. The NWC offers graduate-level training for high policy command and staff function and national strategy planning. Eligibility is limited to senior military and civilian career officials and State Department personnel.

Dr. William G. Lese Jr. is a special assistant to the Deputy Chief of Staff for Operations (Operations Research Analysis), HQ U.S. Army Europe. All of his 12 years of federal career service have been with the Department of the Army.

Dr. Lese is assigned over-all responsibility for development and conduct of studies related to USAREUR force structure issues, evaluations of Army forces combat capabilities, and scientific contacts between USAREUR and NATO nations.

Dr. Lese has a BS degree in mathematics from California (PA) State College, plus MS and PhD degrees in computer science and statistics from the University of Delaware.

He has authored 15 published articles and is a member of the American Statistical Association, Institute of Mathematical Statistics, Association of the U.S. Army and Phi Sigma Pi, Chi Beta Psi and Sigma Psi.

INDUSTRIAL COLLEGE OF THE ARMED FORCES. ICAF provides graduate-level instruction relative to areas of national security and management of national resources.

John A. Christians, a federal employe for 17 years, is chief of the Systems Office, U.S. Army Mobility Equipment R&D Command, Fort Belvoir, VA. He is responsible for providing system analyses and operational

research support for MERADCOM.

Selected to participate in the Army Materiel Development and Readiness Command's Materiel Acquisition and Readiness Executive Development (MARED) Program, he has an engineering degree from the Colorado School of Mines and a master's in administration from George Washington University.

Andrew R. D'Angelo is deputy project manager for the Firefinder advanced weapon locating radar systems, with a staff of about 30 engineers and specialists, involving projects having an R&D value in excess of $100 million. A Federal Civil Service employe for more than 18 years, D'Angelo holds a BS degree in industrial management from Long Island University and an MBA degree from Monmouth (NJ) College.

Honored in 1976 with a Secretary of the Army Award for Outstanding Achievement in Materiel Acquisition, he is a member of the Association of the U.S. Army, American Defense Preparedness Association, and American Society for Quality Control.

Robert D. Galloway is a supervisory budget analyst serving as chief of the Operating/Support Forces Division, Directorate of Operation and Maintenance, Office of the Comptroller of the Army. He is backed by more than 22 years of federal service.

Graduated with a BA degree in history from Northern Iowa University in 1952, Galloway is a member of the American Society of Military Comptrollers. He has received five outstanding performance awards and the Army Decoration for Meritorious Civilian Service.

Kenneth D. Griffiths is an analyst in the Directorate for Procurement and Production, HQ U.S. Army Materiel Development and Readiness Command, Alexandria, VA.

Considered by his peers as an expert on technology transfer, he has a bachelor's degree in business administration from the University of Utah and an MBA degree from George Washington University.

Robert V. Johnson Jr., a federal government employe for 13 years, is a supervisory aerospace engineer assigned as deputy chairman, Utility Tactical Transport Aircraft System Source Selection Board. He is a member of the American Helicopter Society and the American Institute of Aeronautical Astronautics.

Among his academic credentials are BS and MS degrees in aeronautical engineering from the University of Notre Dame and an MS in systems management from the University of Southern California extension school.

Harold L. Mabrey, a 19-year federal employe, is a supervisory contract specialist in the Directorate for Procurement and Production, U.S. Army Aviation Systems Command.

Graduated with honors from the Defense Advance Procurement Management Course, Mabrey earned a BS degree in business administration from Lincoln University of Missouri in 1955 and an MBA from George Washington University in 1971.

ARMED FORCES STAFF COLLEGE (AFSC), Norfolk, VA, conducts studies pertinent to national and international security and the world environment. Training is designed to prepare selected civilians and military personnel for duty in joint and combined commands.

Mervyn M. Copeland is chief, Projects Development Division, U.S. Army Research, Development, and Acquisition Information Systems Agency, a support agency of the Office, Deputy Chief of Staff for Research, Development, and Acquisition.

Graduated with a master's degree in mathematics from University of Missouri, Copeland has been a federal employe for seven years. He is a member of the Washington Operations Research Council and the Mathematical Association of America.

William M. Wilkinson, a federal employe for more than nine years and a management analyst at HQ U.S. Army Forces Command, is credited with a major role in numerous financial studies having Armywide applications.

Wilkinson has a bachelor's degree in business administration from Virginia Polytechnic Institute and an MS degree in systems management from Florida Institute of Technology.

William F. Ryan Jr. is a logistics management specialist with the U.S. Army Communications Command, Fort Huachuca, AZ. He has an MA degree in public administration from the University of Northern Colorado.

Larry A. Brown, a 12 year federal employe, is a logistics management specialist at the U.S. Army Logistics Center, Fort Lee, VA, where he is concerned with planning, coordinating and evaluating new doctrinal concepts.

Graduated with honors from the Maintenance Management Intern Program, he is a member of the Society of Logistics Engineers. He has a BA degree in mathematics from Harding College and an MA in business and computer systems from Virginia Commonwealth University.

ARMY WAR COLLEGE, Carlisle Barracks, PA, offers training to prepare graduates for senior command and staff positions in the Army and throughout the defense establishment. The AWC promotes understanding of the art and science of land warfare.

Joseph E. Koletar Jr. is chief of the Current Forces Group, Force Concepts and Design Directorate, U.S. Army Concepts Analysis Agency. He directs analyses of capability of the Army for its wartime mission in NATO.

Formerly assigned to the Office of the Comptroller, Department of the Army, he has BS and MS degrees in physics from Bucknell University and has done graduate work in physics at the University of Maryland. He is a member of the Washington, DC, Operations Research Council.

ARMY WAR COLLEGE CORRESPONDING STUDIES COURSE (nonresident) augments the resident course in preparing Army officers and key civilians to exercise command, and to execute staff responsibilities at major military and departmental headquarters.

Charles D. Balzarini is chief, Construction Management and Policy Division, Office of the Engineer, HQ U.S. Army Communications Command.

A registered professional engineer in Wisconsin and a member of the Society of American Military Engineers, Balzarini has a BS degree in civil engineering from Michigan State University and has completed the ICAF nonresident course.

Lewis T. Houston is deputy division chief, Army Field Systems, U.S. Army Computer Systems Support and Evaluation Agency.

A recipient of outstanding performance awards for the past eight years, he is backed by 15 years of federal employment. He has a BA degree in mathematics from Kalamazoo College and MPA (ADP) from American U.

MARED Selectee List Evidences . . .

High Caliber of DARCOM Potential Managers Source

Selection of 70 personnel for participation in the 1977 Army Materiel Development and Readiness Command Materiel Acquisition and Readiness Executive Development (MARED) Program has been announced.

Initiated in January 1976, the MARED Program is designed to identify and provide career development opportunities for civilian employes whose records indicate high potential for executive responsibilities, and to provide training to maximize this potential.

Selection criteria include employment in positions classified GS-13 through GS-15 as scientists or engineers, procurement, quality and reliability assurance, supply management and materiel maintenance management. Selectees must commit themselves to geographical mobility and five years of additional U.S. Government service.

Qualifications of applicants are reviewed at field command level and are further reviewed by a DARCOM career program panel. Final selections are made by a high-level MARED Board. More than 160 applicants were nominated this year by commanders of agencies in which they are employed.

A 4-day seminar will be held June 26-30 at Atlanta, GA, to provide all selectees with individual counseling and an Individual Development Plan (IDP) outlining short- and long-range training and duty assignments.

The 1977 MARED Program selectees are comprised of 18 GS-13, 12 GS-14 and 5 GS-15 scientists and engineers; 4 GS-13 and 2 GS-14 materiel management personnel; 2 GS-13 and 1 GS-14 quality assurance careerists; 5 GS-13, 4 GS-14 and 2 GS-15 procurement employes; and 10 GS-13 and 5 GS-14 supply personnel.

Listed by their agency/activity, the 1977 MARED Program selectees and job titles are: *U.S. Army Mobility Equipment Research and Development Command.* Robert L. Barnard, electronics engineer; Donald D. Faehn, mechanical engineer; David C. Heberlein, research physicist; Johann A. Joebstl, research chemical scientist; Stuart A. Kilpatrick, general engineer; David Stefanye, physical science administrator.

U.S. Army Electronics Command. John A. Beekman, contract specialist; James A. Carter, Allan W. Madnick and James M. Skurka, electronics engineers; Raymond P. Montecalvo, contract specialist; David L. Rosenkrans, supply management representative; Albert J. Talerico, electronics engineer; Melvin Trachtman, systems analyst; Joseph R. Varady, procurement officer; Robert W. Walton, inventory management specialist; Robert J. Ruth, general engineer (Night Vision Laboratories).

U.S. Army Natick Research and Development Command, Philip Brandler, operations research analyst. *U.S. Army Missile Materiel Readiness Command,* James E. Brannon, procurement analyst; David T. Carr, general supply specialist; David B. Dalton, MIRCOM equipment specialist assigned to the Joint U.S. Military Advisory Group, Korea; James S. Hinkle, general engineer; Frank Marksberry, equipment specialist.

U.S. Army Aviation Systems Command, James R. Brennan, industrial management officer; Paul L. McLaird, inventory management specialist; Robert L. Walking, quality assurance specialist. *U.S. Army Armament Materiel Readiness Command,* Richard P. Burns, industrial specialist;

(Continued on Page 36)

Anthony N. Costa and Arnold S. Kublin, contract specialists; John A. Jacobi, industrial engineer; David T. Kneer and William E. Swain, supply specialists; Richard C. Martello, procurement officer; Bernard C. Witherspoon, operations research analyst.

HQ U.S. Army Materiel Development and Readiness Command, Bryan W. Butler, industrial engineer; Roger L. Coombs, Doyle E. Waybright, and Emery C. Harmon, logistics management specialists; John Gensior, physical science administrator; Arthur M. Guelcher, systems analyst; Larry P. Hill, quality assurance specialist; Ronald A. Mlinarchik, electronics engineer; Henry S. Mlodozeniec, general engineer; Maxwell E. Westmoreland, industrial engineer.

Patriot (Missile System) Project Office, Larry O. Daniel, and James H. Donnelly, industrial engineers, and Douglas C. Seay, operations research analyst. *U.S. Army Troop Support Command,* Donald K. Johnson, general supply specialist; Kenneth Orf, industrial specialist; Thomas Throne, logistics management specialist.

U.S. Army Tank-Automotive Materiel Readiness Command, Paul J. Miller, operations research analyst, and B. Lee Reeves, logistics management specialist.

White Sands (NM) Missile Range, Weldon A. Findley, operations research analyst and James A. Graves, operations research analyst. *U.S. Army Ballistic Research Laboratory,* Walter Z. Collings, mechanical engineer. *U.S. Army Armament Research and Development Command,* Marvin F. Dietrich, general engineer. *Badger Army Ammunition Plant,* David C. Fordham, engineer. *Cold Regions Test Center,* William J. Haslem, technical adviser. *Detroit Arsenal,* Alois M. Holts, logistics management specialist. *Metrology and Calibration Center,* Millard M. Jernigan, materiel management specialist. *Project Galaxy,* Clair A. Kepler, equipment specialist; *U.S. Army Test and Evaluation Command,* Richard I. Kolchin, electronics engineer.

U.S. Army Materials and Mechanics Research Center, Robert W. Lewis, research engineer. *U.S. Army Missile Materiel Readiness Command,* Joel D. Mathis, general engineer. *Lostistics Assistance Office Europe,* Donald F. Pittman, logistics management officer. *Dugway Proving Ground,* Lothar L. Salomon, physical science administrator. *Communications Systems Agency,* Elmer L. Simmons Jr., inventory management specialist. *U.S. Army Training Devices Agency (Naval Training Center),* Edwin A. Trier, general engineer. *Rock Island Arsenal,* Edward H. Wyatt Jr., quality assurance specialist. *ECOM Project Management Office, Navigation/Control Systems,* T. E. McGuire, operations research analyst.

First APG Employe Selected for IAF Program

Kenower Coakley's selection for 12 weeks of of training under the Intergovernmental Affairs Fellowship Program (IAFP) makes him the first Aberdeen (MD) Proving Ground civilian employe to participate in the program since its inception in 1970.

Coakley is chief of the Organization and Utilization Division, Plans, Training and Force Management Directorate, and is studying for his BA degree in business administration at Upper Iowa University. In addition to an associate degree in industrial management from the University of Baltimore, he has completed courses at the Army Installation Management Engineering Training Agency and the Army Logistic Management Center, Fort Lee, VA.

Kenower Coakley

Conducted by the U.S. Civil Service Commission, the IAFP provides management training, short-term study and work tasks for federal, state and local government mid-level managers and executives.

Only 172 federal, state and local career personnel have been selected for IAFP training since its inception. Each out-of-agency assignment is tailored to an individual's specific career development needs.

DA Approves New 6-Week PM Development Course

Established to meet Officer Personnel Management System needs for Army captains entering project management assignments, a 6-week PM Development Course was approved by HQ Department of the Army.

Developed by the U.S. Army Logistics Management Center, the course will familiarize officers and civilians with principal functions relative to more effective completion of PM assignments.

Instruction on the four phases of a major weapons systems acquisition will include discussions of systems engineering; integrated logistics; contract, financial, and project management.

Prominent senior personnel from various project management offices will serve as guest speakers when the initial course convenes June 6 with an enrollment of 32 persons.

Bartell Chosen for Top-Level Management Course

Robert P. Bartell

Robert P. Bartell, a chemical engineer at the U.S. Army Environmental Hygiene Agency, Aberdeen (MD) Proving Ground, has been selected to attend a 10-month, top-level management course sponsored by the U.S. Civil Service Commission.

Assigned to EHA's Air Pollution Engineering Division, Bartell is one of only eight Department of the Army civilian employes who will participate in the Education Program for Public Management at the University of Washington during 1977-78.

Credited with technical and policy level achievements relative to air pollution abatement at numerous Army facilities, Bartell is termed a "recognized expert" in applying engineering philosophy to air pollution surveillance and control activities.

Lead program manager in his division for evaluating pollution emissions from a wide variety of stationary chemical and combustion processes, he recently analyzed a series of complex engineering systems for safe disposal of toxic materials.

Employed at the EHA for nine years, Bartell has a bachelor's degree in chemical engineering from St. Mary's Spring Academy, Fond du Lac, WI.

Final DARCOM-Sponsored CAD-E Class Graduates

Eleven U.S. Army Materiel and Readiness Command (DARCOM) and one Corps of Engineers civilian employes completed the fifth and final class of the DARCOM-sponsored Computer-Aided Design and Engineering (CAD-E) course at the University of Michigan.

The CAD-E course was initiated by DARCOM (then the Army Materiel Command) in 1972 to develop a nucleus of expertise (about 100 individuals) through one year of intensive training in computer operation, programing and hands-on experience in computer interactive graphics.

Leading to an MS degree, the course was structured to prepare the graduate to serve as an adviser/consultant on computer-aided technology within his command or laboratory. Nominees were required to have a baccalaureate degree and an undergraduate averge of "B" or above; also, to have at least three years of design and/or engineering experience.

Graduates of the 1976-77 CAD-E class and the activity at which they are employed include:

William H. Bolte and Dennis M. Coon, U.S. Army Armament R&D Command (ARRADCOM), Dover, NJ, and Thomas W. Crimmins, ARRADCOM Chemical Support Laboratory, Aberdeen Proving Ground, MD; Steven J. Choy and Thomas P. Wright, Harry Diamond Laboratories (HDL), Adelphi, MD; Joseph A. Compton, U.S. Army Test and Evaluation Command (TECOM), APG, MD;

Joseph C. Craft, U.S. Army Missile R&D Command (MIRADCOM), Huntsville, AL; Michael D. Hanson and Samuel R. Hurt, U.S. Army Aviation Systems Command (AVSCOM), St. Louis, MO; Michael A. Swim, U.S. Army Armament R&D Command (ARRADCOM), Rock Island Arsenal, IL; Porter B. Taylor, U.S. Army Electronics Command (ECOM), Fort Monmouth, NJ; and Leonard J. Zabilansky, U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, NH.

OR/SA Military Applications Course Announced

Operations Research/Systems Analysis Military Applications is the title of a new 12-week course for Army officers, scheduled to start Aug. 29 at the U.S. Army Logistics Management Center, Fort Lee, VA.

The course is specifically for personnel enrolled in the Officer Personnel Management System Specialty Code 49 who do not possess a graduate degree in either OR/SA engineering or business.

Subjects including basic statistics and OR/SA theory and methodology as well as instructional techniques, are structured to provide graduates with the skills necessary to conduct, evaluate and interpret OR/SA studies for decision-makers; also, to communicate effectively with systems analysts and operations research specialists.

Enrollment in the class should occur prior to an officer's initial OR/SA tour or as soon as possible after this tour begins.

The ALMC also has announced a continuing education program for OR/SA officers, featuring short, intensive courses such as "Goal Programing" by Dr. Sang M. Lee, University of Nebraska, tentatively scheduled for July 25. Additional information may be obtained from the Chairman, Systems and Cost Analysis Department, School of Logistics Science, ALMC, Fort Lee, VA 23801.

AIAA Chooses Dr. Collings as Congressional Fellow

Dr. Walter Z. Collings

Dr. Walter Z. Collings, one of 70 Department of the Army employes selected to participate in the Materiel Acquisition and Readiness Executive Development Program, has been selected a Congressional Fellow by the American Institute of Aeronautics and Astronautics.

Employed at the U.S. Army Ballistic Research Laboratory as a mechanical engineer, Dr. Collings will spend a year in Washington, DC, working for a U.S. senator, representative or on the staff of a congressional committee.

Congressional Fellowship service is programed to develop managerial and executive effectiveness through participation in the congressional process. Dr. Collings plans to make this training an integral part of his MARED development plan.

Dr. Collings graduated with BS, MS and PhD degrees in mechanical engineering from the University of Delaware. He is a recipient of fellowships from the National Science Foundation, the U.S. Department of Health, Education and Welfare, and the Army Corps of Engineers.

Author of numerous technical reports, conference papers and articles in professional media, he is a member of the American Defense Preparedness Association, the American Institute of Aeronautics and Astronautics, and the International Institute of Strategic Studies.

54 Graduate From ALMC/FIT Cooperative Programs

Graduation ceremonies for 54 military and civilian personnel in the Cooperative Master of Science Degree Programs in Logistics Management and Contract and Procurement Management were held in June at the U.S. Army Logistics Management Center, Fort Lee, VA.

One hundred and 89 personnel had graduated prior to the eighth commencement ceremony. Intent of the programs is to produce highly qualified logisticians for key military and civilian assignments.

Each 11-month program uses the ALMC 19-week Logistics Executive Development Course as the core curriculum, supplemented by graduate course offerings at Florida Institute of Technology at Melbourne Management Science Department.

The programs were initiated in 1973 under sanction of the Office, Deputy Chief of Staff for Personnel, HQ Department of the Army.

Women in Army Science...

Clothing Designer Acclaimed for Achievements

Sirvart Mellian with mold for policewoman's ballistic vest.

Staging a high society Boston wedding with the bride in a bullet-proof vest and combat boots, by way of a bizarre, innovative attraction, might be relatively simple - if such a request were directed to Sirvart Mellian.

Mellian is an Army clothing designer with the Natick (MA) Research and Development Command, an 11-year resident of the Boston area, and a 1970 graduate from the School of Fashion Design (SFD) in Boston's posh Newbury Street fashion district.

Born in Turkey, the daughter of a couturier, she grew up working in the family design shop. As a university student, she studied journalism during the day and design at night. Marriage brought her to the U.S. in 1966.

Following graduation from SFD, she taught at Boston's Cinderella and Patricia Stevens career schools. Later she worked as a design consultant, quality controller for a Boston rainwear company, and periodically as a free-lance bridal consultant.

Testimony as to her "talent to tackle tough tasks" came recently when she was presented SFD's 1977 Distinguished Alumni Award for her knowledge and instinct for design. SFD President Richard Alartosky termed her a "designer's designer."

Army projects since joining Natick in 1975 have included design of a nurse's uniform and various items of field clothing. Her most interesting assignment was design of a Kevlar bullet-protective vest for lady detectives. Among 10 vest seam designs submitted for consideration to the Baltimore Police Department, her entry was the only one that proved satisfactorily effective, and she has applied for a patent.

Mellian notes that "designing three sellable garment lines a year in the commercial world of high fashion is quite different from designing for the Army. Most styles in the commercial field return to vogue every 25 years.

"In the Army, it's just the opposite - when you design an item, you know it's probably going to stay in fashion for at least 20 years. Every garment must be functional, durable and good looking. The American soldier should be the best dressed in the world!"

An active member of Boston's Armenian community, Sirvart organized an alumni association for graduates of the Essayan and Getronagan High Schools in Istanbul. The group raises money to send Turkish youth to Armenian high schools.

She is also a member of Harvard University's National Association for Armenian Studies and Research and serves twice a month as group leader for a NARADCOM-sponsored all-girl Explorer Scout group.

Courting Catastrophe. . .
SP4 Terms Bomb Disposal Duties 'Challenging'

SP4 Janet Miller and SSG Christopher J. O'Reilly defuse an artillery round in training with 149th Explosive Ordnance Detachment.

Are you inclined to complain about on-the-job tensions? Do you often find yourself "up tight," feeling that you are about ready to explode - to burst into vocal violence? If so, you may "cool it" after considering the duties of SP4 Janet Miller at Aberdeen (MD) Proving Ground.

SP4 Miller is a team member of 10 soldiers in the 149th Explosive Ordnance Detachment (EOD), on constant readiness for rapid response to military and civilian emergency calls-for-help regarding bomb threats, chemical spills and nuclear accidents.

She is one of only five enlisted women explosive ordnance disposal specialists (MOS 55-D) in the U.S. Army - after having completed a training program in which more than 60 percent of her classmates failed to graduate. She defuses bombs, always aware that despite the utmost caution one could end her life.

EOD students undergo 20 weeks of intensive study, including such subjects as physics and engineering, at Redstone Arsenal, AL, and the Naval Ordnance Station, Indian Head, MD. SP4 Miller's most challenging course was "introduction to nuclear weapons. Even the basic and practical work was hard."

Graduates may be assigned to units in the continental U.S., Hawaii and Europe. Assignments can include VIP protection (plain clothes) and trouble shooting chemical and nuclear hazardous situations.

"EOD is a touchy business," she says, "where generally the best surprise is no surprise. The work is usually exciting and always challenging." The 23-year-old brunette adds that "every mission is potentially dangerous.

(Continued on page 38)

When you are on standby, the phone will ring, you round up your people, jump in your truck and away you go. No two jobs are exactly alike."

Her unit provided protection to several political candidates during the 1976 national elections. Specific areas were searched prior to arrival of the dignitaries to safeguard against the planting of explosive devices.

Enlisted in the Army 18 months ago, SP4 Miller became interested in EOD after enrollment in the Ammunition Storage Operations School at Redstone Arsenal. Eventually, she plans to earn a college degree in criminology and social problems.

Although only 5'4" tall, she has demonstrated she can carry a 150-pound person to safety. Her supervisor describes her as "more than willing to pitch in no matter what the job."

Like most members of her detachment, she lives on post. Her leisure activities include skiing, tennis, basketball, softball and camping. When she was in high school, she performed in synchronized (water ballet) swimming.

Tension is to her not a personal problem - at least no more than to other members of the 10-member team of which she is proud to be a part.

Awards...

Rockefeller Public Service Awards . . .

Dr. McDaniel Selected by Army as Sole Nominee

Dr. John L. McDaniel

Department of the Army sole nominee for one of five $10,000 Rockefeller Public Service Awards in 1977 is Dr. John L. McDaniel, whose 35-year U.S. Civil Service career has been devoted wholly to missile R&D - all of it at Huntsville, AL, or Redstone Arsenal, AL. In previous years as many as seven U.S. Army nominations have been placed.

Currently assigned as a GS-18 deputy and technical director of the U.S. Army Missile Research and Development Command, Dr. McDaniel has often been honored as one of the Army's most distinguished scientists and administrators.

Sponsored by John D. Rockefeller III, the awards program is administered by the Woodrow Wilson School of Public and International Affairs at Princeton University. Final approval of U.S. Government nominees rests with the Civil Service Commission. Seven categories of service are listed for 1977.

Nominees, however, are not limited to U.S. Government agencies. In 1976 the program was expanded to honor persons in and out of government at all levels - local, state or national - who have made important contributions to the public service. Nine critical problem areas were identified in 1976.

Controversial issues are recognized as part of the defined problem areas. Achievements not within these defined areas also may merit a nomination, as long as the contributions to national issues are considered thoughtful, imaginative and significantly important.

Dr. McDaniel's nomination is based on his notable achievements in addressing the Rockefeller Public Service Award category of "Enhancing partnership between the public and private sectors in the public interest."

More precisely, his nomination is supported by his "decisive role in visualizing and advancing numerous Army research and development programs . . . (and for) leadership and management of community services leading to an extremely harmonious relationship between the Huntsville community and Redstone Arsenal."

The justification statement supporting Dr. McDaniel's nomination credits him with investigating, analyzing and recommending changes to all human resources manpower problems in the Huntsville/Madison County area, including management system analysis, input-output mode computer characteristics and cost-benefit analyses.

Cited also are his achievements in directing laser research investigations, including pulsed and continuous laser beams. These experiments were later used in development of a self-cauterizing "bloodless" surgical technique. Wide applications of laser technology in surgery today are credited largely to pioneering work at Redstone Arsenal under Dr. McDaniel's direction.

"These early accomplishments," the nomination states, "no doubt influenced decisions at the national level which resulted in assignment of Dr. McDaniel's research group to play a central role in high-energy laser research."

Dr. McDaniel also is cited for his efforts leading to construction of Redstone's Advanced Simulation Center, and for community achievements in providing special opportunities for underprivileged young people.

A member of the Huntsville Manpower Area Planning Council, Dr. McDaniel has authored numerous science and technology papers. He is listed in *Who's Who in America, Who's Who in Alabama, American Men of Science,* and *National Register of Scientific and Technical Personnel.*

Additionally, he is a recipient of a 1961 Army Research and Development Achievement Award, a member of the U.S. Army Research Office Intra-Army Committee, the Committee on Federal Laboratories, and a Fellow of the American Institute of Aeronautics and Astronautics.

Engineer Personnel Earn National Recognition

National recognition for exceptional achievements was accorded recently to three U.S. Army Corps of Engineers employes when they were selected for 1976 awards of notable distinction.

William J. Flathau, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, was awarded the Society of American Military Engineers' (SAME) Wheeler Medal. The accompanying citation acclaimed his "leadership and technical ability in developing a modified version of the proposed Command Center for Supreme Headquarters Allied Powers Europe."

Named in honor of former Chief of Engineers LTG R. A. Wheeler, the award is presented annually in recognition of an outstanding contribution to military engineering through achievement in design, construction, administration, research and development.

Henry W. Holliday, U.S. Army Engineering District Alaska, received SAME's *George W. Goethals Medal* for "outstanding engineering judgment, design achievements, and construction management" for the relocation of the Snettisham Hydroelectric Transmission Line in Juneau. The Goethals Medal was established in memory of the builder of the Panama Canal and is presented annually to a civilian or military engineer for eminent and notable contributions in design, construction and methods engineering.

Thorndike Saville Jr., Coastal Engineering Research Center, Fort Belvoir, VA, was elected as a member of the National Academy of Engineering of the United States. He was cited for "leadership, vision and innovation in coastal engineering."

Election to the Academy is the highest professional distinction that can be conferred on an engineer and honors those who have made important contributions to engineering theory and practice or who have demonstrated unusual accomplishments in the pioneering of new and developing fields of technology.

Dr. Crow Wins 1976 DARCOM Systems Analysis Award

Contributions to development and application of reliability growth methodology have earned Dr. Larry H. Crow of the Army Material Systems Analysis Activity, Aberdeen (MD) Proving Ground, the 1976 Systems Analysis Award from the Army Materiel Development and Readiness Command.

"This innovative methodology provides an effective tool to assist program managers in the proper resource allocation to insure the development of Army systems with the desired performance characteristics and within the required cost and time constraints," the justification for the award states.

Dr. Larry H. Crow

Assigned to the Reliability, Availability and Maintainability Division at AMSAA, Dr. Crow holds a PhD in probability and statistics, an MS degree in statistics, and a BS degree in mathematics and statistics, all from Florida State University.

In 1974 he was named one of the Outstanding Young Men of America. A member of Sigma XI Honorary Society and the National Institute of Health Fellowship, he has authored numerous government and scientific articles.

Mather Gets Category II Building Research Award

Notable contributions to construction technology have earned a Building Research Advisory Board Category II award for Bryant Mather of the U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Chief of the WES Concrete Laboratory since 1966, Mather has supervised research in all aspects of concrete behavior under stress and envi-

Bryant Mather

ronmental conditions, including the chemical and physical properties of aggregate deterioration and use of pozzolans in concrete.

Category II awards are presented for contributions achieved specifically through material, product, component or building system "invention or innovation." Mather was cited for promoting use of X-ray diffraction and spectroscopy and infrared spectroscopy.

He has received numerous awards from and served as president of the American Society of Testing Materials and the American Concrete Institute.

Alexander Presents 1977 Army Pace Awards

Secretary of the Army Clifford L. Alexander has presented the 1977 Pace Awards to LTC Thomas E. Weber, Office, Deputy Chief of Staff for Personnel, and John H. Armstrong, Office, Assistant Chief of Staff for Intelligence.

Initiated in 1963, the awards are named in honor of former Secretary of the Army (1950-53) Frank Pace Jr. Special recognition is given annually to one Army officer and one civilian employe for outstanding individual achievement.

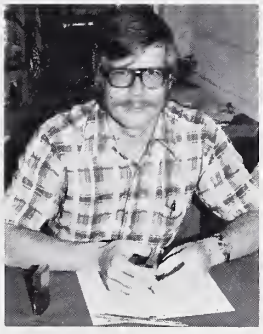
Primary consideration for the award is based on completion of a significant task or staff assignment which has brought benefit to the Army. This may include improvement in service, substantial financial savings or a significant technological or military development.

LTC Weber, a staff officer, was cited specifically for the conceptual design, development and implementation of the Army Training Requirements and Resources System, termed a major improvement in the management of military training.

Armstrong, an intelligence research specialist, received his award for developing and conducting a comprehensive study which identified a significantly increased North Korean armor capability.

CERL Researcher Earns Welding Society Award

Welding research leading to progress in structural design has earned the American Welding Society's A. E. Davis Silver Medal for Edward Cox, U.S. Army Construction Engineering Research Laboratory, Champaign, IL.



Edward Cox

Assigned to CERL's Metallurgy Branch, Cox was cited for submission of a paper titled "Influence of Inadequate Joint Pentration on Tensile Behavior of A514 Steel Welds." This research outlines criteria to determine the quality for specific welding jobs.

Many design specifications have required virtually perfect welds, greatly increasing the complexity and welding cost of process and non-destructive tests. Cox and his research associates found that welds to be subjected only to static loads could be considerably less than perfect but still be well within strength tolerances.

A PhD candidate in theoretical and applied mechanics at the University of Illinois, Cox has done research at CERL in metal corrosion, stress cracking and fracture analysis, welding techniques and material selection.

Cox is a member of the American Society for Metals, American Foundrymen's Society, American Society for Testing and Materials, National Society of Professional Engineers, and the Illinois Society of Professional Engineers.

Ordnance Hall of Fame Installs 7 New Members

Commendable contributions to U.S. Army Ordnance Corps operations were recognized recently with installation of seven new members into the Ordnance Hall of Fame at the U.S. Army's Aberdeen (MD) Proving Ground.

Commander of the U.S. Army Ordnance Chemical Center and School BG Duard D. Ball presided at ceremonies commemorating the 165th anniversary of the Ordnance Corps. Established in 1969, the Hall of Fame contains photographs of all members and a brief description of their achievements.

Among new inductees is LTC (USA, Ret.) Natale Cancilla, the first U.S. Army Materiel Development and Readiness Command (DARCOM) civilian employe ever inducted into the AO Hall of Fame. GEN Henry A. Miley (USA, Ret.), former DARCOM commander, is the only other DARCOM Hall of Fame member. Cancilla was cited for creation of a production pyramid which greatly increased U.S. tank production capabilities during World War II.

Other new Hall of Fame inductees are Dr. Robert H. Goddard (deceased), father of U.S. rocketry for whom the Goddard Space Flight Center is named; Vincent P. Huggard (deceased), former Secretary of the Army for Installations and Logistics, cited for revamping the ground munitions supply system during the Vietnam conflict; MG (USA, Ret.) Floyd A. Hansen, former commander of the U.S. Army Munitions Command, who was credited with modernizing the Army's Ammunition Reporting and Logistics Management Systems; and

MG (USA, Ret.) John Hayes for successful planning and implementation of movement of more than 10,000 tons of toxic chemical munitions from Okinawa to Johnston Island; Eugene Stoner, designer and developer of the M-16 rifle; and Frank Jervey, a leader during World War II and the Korean War in ammunition production and for coordinating activities of 13 government owned ammunition plants.

ORDNANCE Hall of Fame inductee Natale Cancilla holds a Navy 5-shot, 36-caliber Colt revolver, designed and manufactured by COL Samuel Colt around 1820. Cancilla's private gun collection, reportedly one of finest in America, is on loan to a museum in New England.

Microbiology Academy Elects Albertson as Fellow

U.S. Army Medical Research and Development Command Chief of Staff COL John N. Albertson was recently elected a Fellow of the American Academy of Microbiology. He is also a Fellow of the American Association for the Advancement of Science, and in 1974 was awarded the prestigious "A" prefix for professional proficiency presented by the Surgeon General.

COL J. N. Albertson

Known to the Army R&D community for his years of service in the Office of the Chief of Research and Development, first as chief of the Medical and Biological Science Branch, Army Research Office, and then as executive to the Director of Army Research, COL Albertson, was a concert pianist until an accident terminated that career.

Then he entered the Army and returned to school to receive a BS degree in bacteriology and chemical engineering. His master's degrees are in chemistry and microbiology. He also is a graduate from the Army Command and General Staff College, and from the residence course of the Industrial College of the Armed Forces in Washington, DC.

Author of numerous articles in scientific journals, principally on mycobacterial physiology and mycoplasma-virus interactions, he is a member of the American Society for Microbiology, and the American Association for the Advancement of Science. His autobiography is carried in *American Men of Science,* and *Who's Who.*

Electronics VE Awards Honor Work of 5 Firms

Department of the Army Value Engineering awards presented to top executives of five industrial firms at a recent Fort Monmouth, NJ, ceremony acknowledged outstanding contributions to the cost reduction program in acquisition of electronics equipment.

MG John K. Stoner, Jr., commander of the Electronics Command and Fort Monmouth, presented the honors and commended the executives for results of their submissions of VE design change proposals to procurement contracts.

Firms recognized are the Electro-Optical Products Division of IT&T, Roanoke, VA; Cincinnati Electronics, Cincinnati, OH; Honeywell Corp.,

(Continued on page 40)

Tampa, FL; Baltimore Electronics, Baltimore, MD; and Espey Manufacturing Industries Division, Saratoga Springs, NY.

ITT Division President John Johnson accepted the citation for submitting 12 VE proposals on night vision goggles AN/PVS-5.

G. J. Mealey, president of Cincinnati Electronics, accepted a citation for VE savings of more than $150,000 on the KG-27 key generator and radio set AN/GRC-106.

Honeywell's Tampa regional manager, William Delesandro, accepted a citation for three VE proposals that saved the government more than $300,000 on key generator KG-27 and multiplexer TD-660.

James Davenport, general manager of Baltimore Electronics, was commended for VE savings of more than $150,000 on control boxes C-2298 and C-2299.

Espey Industries President Sol Pinsley accepted his firm's citation for three VE change proposals that saved the government more than $150,000 on the antenna group of the AN/TRQ-30 direction finder.

VE awards were initiated by the Army Materiel Development and Readiness Command (DARCOM) for presentations to major subordinate commands. The ECOM program was coordinated by the Fort Monmouth Technical and Industrial Lisison Office.

Reader's Guide . . .

New Mathematical Techniques. . .

Improve Accuracy of Injured Patients' Prognosis

Use of new mathematical techniques in collecting shock trauma data to diagnose the severity of an injury is reported by a U.S. Army biomathematician in a professional journal article titled "A Clinical Algorithm for Evaluation of Blaunt Trauma."

Dr. William Sacco, the author, is chief of biophysics research in the Armament Research and Development Command Chemical Systems Laboratory at Aberdeen Proving Ground, MD.

Working with a group of surgeons under the direction of Dr. R. A. Cowley of the Maryland Institute for Emergency Medicine, Dr. Sacco has applied a mathematical approach to shock problems. He produced a variety of organ and subsystem indices which permit a more accurate prognosis of an injured patient.

Dr. William Long, a surgeon, helped Dr. Sacco produce algorithms termed "decision trees," as explained in a survey article on trauma published in the Royal College of Surgeons of Edinburgh Journal commemorative issue in honor of Sir John Bruce, a renowned Scottish surgeon.

Reportedly, the algorithms represent a first step in mathematical modeling of the complexities of trauma care. Dr. Sacco explains that the new techniques are progressive even though schematic approaches depart from normal medical practices, saying:

"They can be particularly helpful to the clinician inexperienced in trauma care and are invaluable for educational purposes."

Dr. Sacco has been conducting research for the Army at Aberdeen Proving Ground since 1955. He has been applying mechanics, mathematical programing, pattern recognition, and information theory to a variety of Army problems, including the motion of rockets, weapon allocations, and studies of chemical compounds.

Several years ago, he developed a mathematical descripter of the human head, utilized as an instrument for sizing a prototype of the new Army protective field helmet.

New Volumes Describe Electronic Circuit Design

Aspects of electronic circuit design is the subject of two new volumes of the continuing Bugbook Applications Series authored by Howard M. Berlin, an electronics engineer in the Chemical Systems Laboratory, Edgewood Arsenal, MD.

The Design of Active Filters, With Experiments deals with electronic systems. *Basic Operational Amplifier Circuits, With Experiments* details designs and generator functions.

Expected to be translated into German and Japanese, these publications contain user-oriented test/workbooks for self-study or to serve as tests for college courses having a laboratory section.

The first book in this series was titled *The 555 Timer Applications Sourcebook, With Experiments.* A fourth book on *Complementary Metal Oxide Silicon* integrated circuits is programed for publication next year.

Assigned to CSL's Physical Protection Division, Berlin has authored more than 25 articles during seven years of federal service. He has an MS degree in electrical and biomedical engineering from Washington University and is working on his PhD degree in biomedical engineering at the University of Delaware, where he has served as an engineering instructor.

Personnel Actions . .

Dr. Pierre Sworn In as Assistant Secretary (RDA)

Dr. Percy A. Pierre

Dr. Percy A. Pierre was confirmed by the Senate and sworn in during May as Assistant Secretary of the Army for Research, Development and Acquisition succeeding Edward A. Miller who had served since November 1975.

A career academician, Dr. Pierre assumes his new title after serving since 1971 as dean of the School of Engineering at Howard University, Washington, DC. During 1968-71 he was a research engineer with the Rand Corp. He was a White House Fellow in the Office of the President during 1969-70, an assistant professor at the University of California at Los Angeles (1968-69), and a part-time assistant professor at the University of Michigan in 1968.

Other career assignments have included part-time assistant professor, Morgan State College (1964-66); graduate assistant, Johns Hopkins University (1963-64); assistant professor, Southern University (1963); and graduate assistant, University of Notre Dame (1961-63).

Dr. Pierre has bachelor's and master's degrees in electrical engineering from the University of Notre Dame, a PhD from Johns Hopkins University, and has done post-doctoral work at the University of Michigan School of Engineering. He has served as a consultant to numerous organizations, including the Alfred P. Sloan Foundation, Center for Naval Analysis, and the Illinois Board of Higher Education. He also has authored more than 15 publications in professional journals.

Among his professional affiliations are Tau Beta Engineering Honor Society, the National Academy of Engineering, American Society for Engineering Education, Institute of Mathematical Statistics, and IEEE.

Gibbs Sworn In as Army Assistant Secretary (I&L)

Alan J. Gibbs, commissioner of the New Jersey Department of Human Services since 1974, has been sworn in as the new Assistant Secretary of the Army (Installations and Logistics).

Graduated from the University of Illinois with a BS degree in management in 1960 and an MA in labor and industrial relations in 1963, he began his public service career as a labor-management relations examiner with the National Labor Relations Board.

Gibbs was employed (1966-68) as a technical assistance officer with the Equal Employment Opportunity Commission, Washington, DC, followed by two years as area director of Alabama and Tennessee.

He was assistant health services administrator (1970-72), then first deputy commissioner, New York City Health Services Administration.

Starry Follows Depuy as TRADOC Commander

GEN Donn A. Starry

Promotion to 4-star rank came to GEN Donn A. Starry when he took command in June of the U.S. Army Training and Doctrine Command following the retirement of GEN William E. Depuy, who served since TRADOC was established in 1973.

Graduated from the U.S. Military Academy with a BS degree in military science and from George Washington University with an MS in international affairs, GEN Starry had served since February 1976 as commander, V Corps, U.S. Army Europe.

During 1973-76 he commanded the U.S. Army Armor Center, was commandant of the Armor School, and commanded the U.S. Army Training Center, Fort Knox, KY. He was director, Manpower and Forces, Office of the Assistant Chief of Staff for Force Development, DA, 1971-73.

Other assignments have included deputy director, Operations Directorate, Office, Deputy Chief of Staff for Military Operations, Washington,

DC; commander, 11th Armored Cavalry Regt, U.S. Army, Vietnam.

GEN Starry has completed course requirements at the Army Command and General Staff College, Army War College, Armed Forces Staff College, Armor School (basic and advanced), and Ground General School.

His military honors include the Silver Star, Legion of Merit with two Oak Leaf Clusters (OLC), Distinguished Flying Cross, Soldier's Medal, Bronze Star Medal with "V" device and one OLC, Air Medal, Joint Service Commendation Medal with OLC, Army CM, and Purple Heart.

Approved for 3-Star Rank . . .

Baer Succeeding Sammet as DARCOM DCGMD

Promotion to rank of lieutenant general is scheduled for MG Robert J. Baer, project manager of the XM-1 main battle tank since 1972, when he succeeds LTG George Sammet Jr., DARCOM Deputy Commander for Materiel Development for four years, who will end 35 years AD Sep. 1.

MG Robert J. Baer

New Commander of the U.S. Army Materiel Development and Readiness Command GEN John R. Guthrie preceded LTG Sammet in that position until he departed in October 1973 for a new assignment as U.S. Pacific Command deputy chief of staff. LTG Sammet became interim DARCOM commander when GEN John R. Deane Jr. retired Feb. 1, 1977.

MG Baer was honored as the first recipient of the Secretary of the Army Annual Award for Project Management at the Oct. 17-20, 1976 Project Management Conference of the U.S. Army Materiel Development and Readiness Command. The award cited him for completing XM-1 advanced development within cost and schedule constraints, "an achievement of great distinction...."

During 1971-72 MG Baer served as director of Development, Office of the Chief of Research and Development, Department of the Army, and later as deputy chairman of the Wheeled Vehicle Study Group, Office, Chief of Staff, DA. He served briefly during 1970-71 in the Office, Assistant Chief of Staff for Force Development (ACSFOR) as acting deputy director, Doctrine and Systems Directorate and then as chief, Firepower Systems Division, Systems Directorate.

Other assignments have included chief and division chief, Combat Vehicles Office, OACSFOR; commander, 1st Brigade, 1st Cavalry Division (Airmobile), Vietnam; and deputy chief, Civil Operations and Revolutionary Support Directorate, Vietnam.

A 1947 graduate of the U.S. Military Academy, MG Baer has completed requirements at the U.S. Army Command and General Staff College, Armed Forces Staff College, Army War College and the Armored School (basic and advanced courses).

A veteran of more than 29 years of military service, MG Baer wears the Silver Star, Defense Superior Service Medal, Legion of Merit with Oak Leaf Cluster (OLC), Meritorious Service Medal, Air Medal with 11 OLC, and the Army Commendation Medal with OLC.

Berry Assigned as Army Europe V Corps Commander

LTG Sidney B. Berry, superintendent of the U.S. Military Academy since July 1974 and a graduate of that same institution, was selected in June as commander, V Corps, U.S. Army Europe.

His academic credentials include an MA degree in international relations from Columbia University. He also has completed the U.S. Army War College, the Marine Corps School Command and Staff Course, and the Infantry School (basic and advanced courses).

LTG Sidney B. Berry

LTG Berry commanded the 101st Airborne Division (Airmobile) and Fort Campbell, KY, from 1973-74 following assignments during 1972-73 as chief, Office of Personnel Operations, Department of the Army and commander, U.S. Army Military Personnel Center, VA.

Earlier assignments included deputy chief, Office of Personnel Operations, Department of the Army, Washington, DC; assistant division commander, 101st Airborne Division (Airmobile), Vietnam; and assistant commandant, Army Infantry School.

LTG Berry wears the distinguished Service Medal, Silver Star with three Oak Leaf Clusters (OLC), Legion of Merit with three OLC, Distinguished Flying Cross with OLC, Bronze Star Medal with "V" device, Air Medal and the Purple Heart.

Dr. Benenson Named Gorgas Memorial Lab Director

Directorship of the renowned Gorgas Memorial Laboratory in Panama is the new responsibility of Dr. Abram S. Benenson, who gained worldwide recognition as one of the U.S. Army's most versatile research scientists during a 22-year military career terminated when he retired as a colonel in 1962.

Dr. Abram S. Benenson

President (Dr.) Jack W. Millar of the Gorgas Memorial Institute announced the appointment of Dr. Benenson. Director of the Division of Communicable Diseases and Immunology at Walter Reed Army Institute of Research at the time of his retirement, he headed this unit from 1956 to 1960 when it was known as the Division of Immunology.

One of Dr. Benenson's major claims to fame is his research on smallpox vaccination, including development of the jet injector, used for mass immunization in Brazil and West Africa, and a device that contributed to global eradication of this disease. When he became a civilian, he accepted directorship of the Pakistan-SEATO (Southeast Asia Treaty Organization) in Dacca (now Bangladesh) for three years.

Professor and chairman of the Department of Community Medicine, University of Kentucky until he accepted his new position, Dr. Benenson also is well known as the editor of *The Control of Communicable Diseases of Man,* published by the American Public Health Association. He has authored or coauthored a substantial number of medical research articles in professional media.

Research which has internationally enhanced his reputation includes studies on Q fever, typhoid fever, leptospirosis, tetanus, rubella, the widespread and deadly schistosomiases, and various other communicable diseases.

Certified by the American Board of Preventive Medicine, Pathology (clinical) and Microbiology, he is a graduate from Cornell University College of Arts and Sciences and the Medical College.

Dr. Benenson is or has been a member of scientific panels of the World Health Organization, the U.S. National Institutes of Health, and the U.S. National Research Council.

Dr. Benenson succeeds Dr. Pedro Galindo, director of the Gorgas Memorial Laboratory since April 1974 and a celebrated entomologist. Dr. Galindo has recently received widespread professional recognition for his institution of environmental impact studies in the Republic of Panama. In retirement as Director Emeritus, he will continue his association with the laboratory as a consultant.

Means Succeeds Tate as MIRADCOM Commander

MG Charles F. Means

MG Charles F. Means will take command of the U.S. Army Missile R&D Command (MIRADCOM) at Redstone Arsenal, AL, July 15, succeeding BG Grayson D. Tate Jr., who will become commander of the Defense Nuclear Field Command, Aug. 1.

General Means has directed the Patriot Program since 1973, during the period of a crucial series of successful flight tests and program redirection. Planned as the Army's high-altitude air defense system for the 1980's and beyond, Patriot is nearing readiness for production as development testing continues.

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Following an assignment in the Office of the Secretary of Defense, he was assistant deputy chief of staff, Plans and Programs, North American Air Defense Command (NORAD). He served in Vietnam for a year, then commanded the 24th Artillery Group, which included Nike Hercules units in Connecticut, Rhode Island and Massachusetts.

Stationed during 1964-65 on Kwajalein Island, test site for the Huntsville-based Nike-X and later, the Safeguard antiballistic missile defense system, he next commanded a Nike Hercules air-defense artillery battalion in Milwaukee, WI.

After serving at Redstone Arsenal as a captain with the Army Ordnance Missile Command and the Pershing Project Office (1959-63), he attended the Command and General Staff College (C&GSC).

MG Graves Designated Deputy Chief of Engineers

MG Ernest Graves will take over July 1 as Deputy Chief of the Army Corps of Engineers, succeeding MG Robert C. Marshall, whose new assignment is Lower Mississippi Valley Div. engineer.

MG Ernest Graves

MG Graves is serving as director of Civil Works, Office of the Chief of Engineers. In recent years he has served on the staff of Eighth Army Headquarters in Japan and with Supreme Headquarters, Allied Powers Europe (SHAPE) in France.

Other major assignments include command of the 34th Engineer Group (Construction) in the Mekong Delta in Vietnam, command of the 44th Engineer Construction Battalion in Korea, and command of a combat engineer platoon in Europe during World War II.

General Graves was assigned to nuclear weapons testing at Los Alamos and Enewetak, was in charge of training the crew for the Army's first nuclear power plant at Fort Belvoir, VA, and served as a research associate at the Lawrence Radiation Laboratory in Livermore, CA.

Following an assignment as deputy district engineer of the Los Angeles District, he returned to Livermore to become the first director of the Army Engineer Nuclear Cratering Group, engaged in studies of nuclear excavation of an Isthmian sea-level canal.

Other assignments have included: military assistant to the Under Secretary of the Army; executive to the Secretary of the Army; deputy director of Military Construction in the Office of the Chief of Engineers, president of the Air Defense Evaluation Board; Division engineer; North Central Division, Chicago, IL; and director of Military Application, Energy R&D Administration.

A 1944 graduate of the U.S. Military Academy (USMA) and holder of a PhD in physics from the Massachusetts Institute of Technology, General Graves attended the Engineer School, the Navy Post-Graduate School, the Command and General Staff College (C&GSC), the Army War College (AWC); and Advanced Management Program, Harvard Business School.

His decorations and awards include the Distinguished Service Medal, the Legion of Merit (LOM) with Oak Leaf Cluster (OLC), the Bronze Star Medal (BSM); Army Commendation Medal (ARCOM) with 3 OLC, and the Air Medal (AM) with OLC.

MG Charles I. McGinnis, currently the Southwestern Division engineer with headquarters in Dallas, TX, will succeed General Graves as director of Civil Works, Office of the Chief of Engineers.

MG Charles I. McGinnis

MG McGinnis will be responsible for managing the water resources development program of the Corps. The Civil Works active program consists of more than 4,000 projects and project authorizations having an estimated cost of $42 billion.

MG McGinnis has served as lieutenant governor, Panama Canal Zone; vice president, Panama Canal Co.; and director, Engineer and Construction Bureau, U.S. Army, Canal Zone; St. Paul District engineer; staff officer, Construction Directorate, U.S. Military Assistance Command, Vietnam; Comptroller, U.S. Army Engineer District, Far East (Korea); battalion commander, 5th Engineer Battalion (Combat), Fort Leonard Wood, MO; resident and later area engineer, U.S. Army Engineer Division, Mediterranean. He also was an instructor at the Army Command and General Staff College and then assistant professor of military science, Missouri School of Mines at Rolla.

Commissioned in the Army Corps of Engineers in 1949 after graduating from Texas A&M College, MG McGinnis received an MSCE degree from the same college in 1950. He is a graduate of the C&GSC, the Armed Forces Staff College, the Army War College, and is a registered professional engineer in Texas.

BG James C. Donovan will succeed MG McGinnis as Southwestern Division engineer. Now serving as deputy chief of Legislative Liaison, Office of the Secretary of the Army, Washington, DC, he has commanded the U.S. Army Engineer Command Europe, and later was engineer of the U.S. Army Engineer Division, Europe.

In Vietnam, he commanded the 815th Engineer Battalion (Construction), was chief, Installations Division, U.S. Army Engineer Command, and then commanding officer, 937th Engineer Group. He also served as resident engineer, Fort Smith, AR; area engineer, Kaflavik, Iceland; area engineer, Metz, France; staff officer at Orleans, France; and with the Office of Legislative Liaison, Office of the Secretary of the Army; and on the staff and faculty, USMA.

BG James C. Donovan

A 1950 graduate of the USMA, BG Donovan received his MSCE degree from Iowa State College. He also is a graduate of The Engineer School, Command and General Staff College and the Army War College. He is a registered professional engineer in Iowa.

Among his numerous honorary awards are the Silver Star for gallantry in action, the Legion of Merit with OLC, Bronze Star Medal with OLC and the Army Commendation Medal with OLC.

Johnson Picked as North Atlantic Division Engineer

Rotational reassignments involving a swap of positions Aug. 1 will make MG James A. Johnson the North Atlantic Division Engineer and MG James L. Kelly the commander of the U.S. Army Engineer Center and commandant of the Engineer School at Fort Belvoir, VA.

MG Johnson has served in recent years as director of Industrial Preparedness and Munitions Production, Office of the Secretary of Defense, and director of Military Engineering and Topography, OC/Engrs.

MG Johnson was adviser to the Chief of Engineers of the Vietnamese Armed Forces in 1964 and returned for a second tour in 1971 as commander, 34th Engineer Group (Construction). He also was deputy engineer for the U.S. Army and deputy commander of the U.S. Army Engineer Command.

Promoted to engineer of the U.S. Army Vietnam in March 1972, he also served as commander of the U.S. Army Engineer Command, and director of construction, Military Assistance Advisory Command, Vietnam.

General Johnson has served in various positions with the Army Communications Zone in France (1957-60), and with several combat and construction units in Korea and Hawaii (1947-51).

Major stateside assignments include U.S. Army Philadelphia District engineer (1968); assistant and deputy district engineer, San Francisco, and commander, 39th Engineer Battalion, Fort Campbell, KY (1961-64); and Pentagon assignments with the Office of the Army Chief of Staff.

MG James A. Johnson

Graduated from the U.S. Military Academy in 1947, he later earned a master's degree in engineering from Stanford University. He is a graduate from the Command and General Staff College (1961) and the Industrial College of the Armed Forces (1966).

Defense Secretary OKs Johansen as DCS/Logistics

MG Eivind H. Johansen

Secretary of Defense Harold Brown has approved promotion of MG Eivind H. Johansen to 3-star rank and assignment as Army deputy chief of staff for Logistics.

Currently commander of the U.S. Army Aviation Systems, Command, MG Johansen was commissioned in the Quartermaster Corps following graduation from Texas A&M University in 1950 with a BS degree in business administration. He has an MS degree in international affairs from George Washington University and has completed the University of Pittsburgh Graduate School Advanced Management Program.

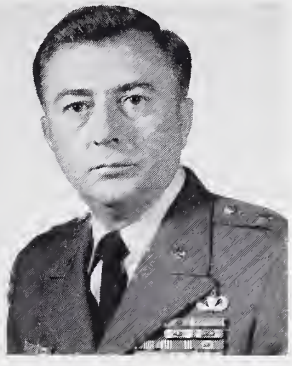
Military schooling has included graduation from the Army Command and General Staff College, Naval War College, Quartermaster officers basic and advanced courses, and the Army procurement course.

During 1972-75 MG Johansen was deputy director for Supply and Maintenance, Office, Deputy Chief of Staff for Logistics (DCSLOG), DA, and later director of Supply, HQ U.S. Army Materiel Command (now DARCOM).

Other assignments with DCSLOG have included chief, Supply Distribution Division and special assistant to the Assistant Deputy Chief of Staff for Logistics. He served in Vietnam as chief, Supply Division, G-4 Headquarters and commander, 593d General Support Group.

Among his military awards are the Legion of Merit with two Oak Leaf Clusters (OLC), Bronze Star Medal, Meritorious Service Medal, Joint Service Commendation Medal and the Army Commendation Medal with two OLC.

Harper Becomes ARRCOM Deputy Commander



BG Henry H. Harper

BG Henry H. Harper is the new deputy commander, U.S. Army Armament Materiel Readiness Command (ARRCOM), Rock Island Arsenal, IL. BG (promotable) Alan Nord vacated that position to become director, Development and Engineering, HQ Army Materiel Development and Readiness Command.

BG Harper served until recently as assistant for Supply Management, Office, Assistant Secretary of the Army for Installations and Logistics, Washington, DC.

Other assignments during his 22-year Army career have included commander (1975-76) 59th Ordnance Group and Pirmasens Military Community, U.S. Army Europe; and commander (1973-75), Miesau Army Depot and Miesau Subcommunity of the Kaiserslautern Military Community, 60th Ordnance Group, USAREUR.

BG Harper has a bachelor's degree in military science and business from the University of Maryland, with a master's in management from George Washington University, Washington, DC. He has completed residence courses at the Command and General Staff College, and the Industrial College of the Armed Forces.

Among his military awards are the Legion of Merit with Oak Leaf Cluster (OLC), Bronze Star Medal, Meritorious Service Medal with OLC, Air Medal, Army Commendation Medal and Senior Parachutist Badge.

Riley Takes Over as USACSC Deputy Commander

Deputy commander, U.S. Army Computer Systems Command, Fort Belvoir, VA, is the new title of BG Leonard J. Riley, following completion of a 2-year tour as commander of the White House Communications Agency.

Commissioned in 1955 through the Providence College ROTC Program, BG Riley earned an MBA from the University of Arizona. He is a graduate of the Command and General Staff College, Army War College, and the Army Signal School.

Major duty assignments have included deputy chief of staff, Communications-Electronics, U.S. Army Forces, AK; commander, U.S. Army Communications Command Agency, AK; and commander of a signal battalion in Vietnam; instructor, Simulator and Computer Directorate, Industrial College of the Armed Forces; and chief, Plans Office, Tactical Operations Systems Development Group, Automatic Data Field Systems Command.

He wears the Legion of Merit with Oak Leaf Cluster (OLC), Bronze Star Medal, Meritorious Service Medal with OLC, Air Medal with OLC, Joint Service Commendation, and the Combat Infantryman Badge.

Cameron Succeeds Harrison as Firefinder PM

LTC Thomas F. Cameron

LTC Thomas F. Cameron has assumed duties as project manager of Firefinder, the Army's new indirect fire hostile weapons locating system, following retirement of COL William J. Harrison.

Graduated in 1958 from the U.S. Military Academy, he has an MS degree in nuclear engineering from the University of Illinois in 1962. He has completed requirements at the Command and General Staff College, Industrial College of the Armed Forces, Ordnance Officers Advanced Course, Airborne School, and the Field Artillery Basic Course.

Other assignments have included director of Ammunition, U.S. Army Support Command, Vietnam; commander, 83d Ordnance Battalion (Special Weapons), Eighth Army, Korea; and director of Academic Services, Army Ordnance Center and School, Aberdeen (MD) Proving Ground.

A career Ordnance Corps officer, LTC Cameron is a recipient of the Bronze Star Medal, Meritorious Service Medal, and the Army Commendation Medal with Oak Leaf Cluster.

ACC Announces New Senior Technical Director

Leonard J. Mabius has a new assignment as senior technical director and chief engineer for the U.S. Army Communications Command (ACC), headquartered at Fort Huachuca, AZ.

Mabius was formerly technical director of ACC's Communications Systems Agency, following duty as technical director for the Communications-Electronics Engineering Installation Agency (CEEIA), Fort Monmouth, NJ.

He began his Civil Service career in 1969 as an electronic engineer with the Army Strategic Communications Command (now ACC), and moved to the Safeguard Communications Agency as director for engineering in 1970, after serving as test director for the AUTOVON program.

Graduated in 1961 from Rutgers University with a bachelor's degree in electrical engineering, he served briefly with Pennsylvania Power and Light Co. before entering the Army as a second lieutenant.

Mabius has a master's degree (cum laude) from the University of Colorado. He is a member of the Armed Forces Communications and Electronics Association, the Research Institute of America and a senior member of the Institute of Electrical and Electronic Engineers.

Engineer Corps District Assignments Announced

Selection of COL Thomas P. Nack as Louisville (KY) District engineer and COL Clark H. Benn as New York (NY) District engineer, effective in August, has been announced by the U.S. Army Corps of Engineers.

Graduated in 1954 with a BS degree in agricultural economics from the University of Tennessee, COL Nack is now serving as chief, Management and Systems Division, Facilities Engineering Directorate, Office, Chief of Engineers, Washington, DC.

Listed on his career assignments are commander, 547th Combat Engineer Battalion; commander, 549th Engineer Battalion; instructor, U.S. Army Engineer School; Army General Staff; and tours abroad in Vietnam and Europe and Canada and Colombia.

Registered as a professional engineer in Missouri, COL Nack has a BS degree in civil engineering from the Missouri School of Mines. He is also a graduate from the National War College, the Command and General Staff College and the University of California Summer Executive Program.

COL **Benn** is now chief of Installations Division, Office of the Deputy Chief of Staff, Engineer, HQ U.S. Army, Europe, Heidelberg, Germany. His new assignment will entail responsibility for the Corps' North Atlantic Division.

Graduated from the U.S. Military Academy in 1954 he has an MS degree in civil engineering from Iowa State College. He is a graduate from

(Continued on page 44)

Army Command and General Staff College, and Army War College.

COL Benn has served as commander, 249th Engineer Construction Battalion, Karlsruhe, Germany; assistant professor of Military Science, Virginia Polytechnic Institute; resident engineer, Saudi Arabia; and in the Office, Deputy Chief of Staff for Logistics, Department of the Army.

ECOM Picks Field to Head International Logistics

Norman J. Field, a physicist with 35 years of research experience with the U.S. Army Electronics Command and predecessor organizations, has been selected to head its International Logistics Directorate at HQ ECOM, Fort Monmouth, NJ.

His ECOM assignments have included assistant director of the Institute for Exploratory Research, director of the Mathematics Division and Computation Center, and deputy director of Research. He also has been director of Program Management, and director of Procurement, Production and Logistics in the Office of the Project Manager, Army Tactical Communications Systems (ATACS).

Field has many ties with education in the area. He has been a member of the Monmouth Regional High School Board of Education since 1957 and was the Board's president for nine years. He also has been vice president of the New Jersey School Boards Association, president of the Monmouth County School Boards Association, and is now chairman of the Monmouth Adult Education Commission.

He has represented the Third Congressional District on the National School Boards Association's Federal Relations Network for the past four years. While serving with the Physics Department faculty at Monmouth College (1955-73), he helped set up the area Junior Science and Humanities Symposium.

Norman J. Field

Field holds a 1942 BS degree (cum laude) from City University of New York, an MS in physics from the Polytechnic Institute of New York (1959), and did graduate work at Columbia University in science and public policy (1969). He also has attended Monmouth College, Rutgers, Massachusetts Institute of Technology, Oak Ridge Institute of Nuclear Studies, and the Industrial College of the Armed Forces.

He is a member of numerous technical organizations and societies, and is listed in *American Men of Science, Who's Who in the East,* and *Who's Who in American Education.*

NCAPS Elects Army Scientific Leader as President

The National Council of Associations for Policy Sciences has announced election as president of Dr. John G. Honig, assistant to the director, Systems Review and Analysis, Office of the Army Deputy Chief of Staff for Research, Development, and Acquisition.

Other new NCAPS officers are Dr. Janet M. Malcolm, vice president; Henry D. Angelino, secretary; Charles F. Gordon, treasurer (re- elected).

Dr. Honig is known to the scientific community as past president and a founding member of the Washington (DC) Operations Research Society; past president of the Military Operations Research Society of America; Fellow of the American Association for the Advancement of Science; member of the Board of Governors of the Washington Academy of Sciences, and of the Science Advisory Council to the Governor of Maryland.

Dr. John G. Honig

Dr. Malcolm is a management consultant and formerly was director of the Operations Research Program at American University. She has been a trustee and committee chairman in the Washington Operations Research Council and secretary-treasurer of the Florida Section of the American Chemical Society.

Dr. Angelino is employed with the chief, Budget Programs Division, Office of the Comptroller of the Army. He has served on the board of directors and as membership chairman, American Association of Budget and Program Analysts. He also has been active with the American Society of Public Administration and the Washington Operations Research Council.

Army R&D — 15 Years Ago

The Army R&D Newsmagazine reported on...

R&D Commands Shape Up as Generals Get New Jobs

Answers to many questions regarding broad-scale reorganization of Army research and development are being filed in line with the skeletal plan announced in January by Secretary of the Army Elvis J. Stahr Jr.

General officer assignments include MG (P) Dwight E. Beach, Chief of R&D; MG William J. Ely, deputy commander of the new Materiel and Development Logistic Command; BG Chester W. Clark, director of Army Research; MG Alden K. Sibley, commander, Mobility Command;

MG Marshall Stubbs, director of Chemical-Biological-Radiological Warfare, Office of the Chief of Staff for Military Operations; MG (P) August Schomburg, commander, Supply and Maintenance Command; MG Francis J. McMorrow, commander, Army Ordnance Missile Command; MG William K. Ghormley, commander, Weapons Command;

MG Floyd A. Hansen, commander, Ordnance Special Weapons-Ammunition Command; MG Nelson M. Lynde, commander, Weapons Command; MG Stuart S. Hoff, commander, Electronics Command; BG William F. Ryan, commander, Test and Evaluation Agency.

USARO Schedules Move to New Location in June

Relocation of the U.S. Army Research Office in a new building outside a military reservation, to meet requirements of expanding relations with the general scientific community and substantial growth in functions and responsibilities since it was established in 1958, is scheduled in June.

Operating as a directorate of the Office of the Chief of Research and Development, the U.S. Army Research Office controls the planning and coordination of research at a current rate of $165 million annually. USARO has similar responsibilities for medical and meteorological research.

The move will be made from Arlington Hall Station, VA, to the newly constructed Highland Building on Columbia Pike, Arlington, VA, about two miles closer to the Pentagon, hub of the Armed Services staff agencies in the nation's capital. Problems of liaison with other directorates of the Office of the Chief of R&D, and other Pentagon agencies with which USARO maintains close working relationships, are expected to be eased.

Army's Work on Lasers Reported at Symposium

Far-ranging interest of the U.S. Army in immediate and potential application of lasers to military requirements was indicated at the first International Laser Symposium held at the Hague, Netherlands.

Sponsored by the SHAPE Air Defence Technical Centre at the Hague and by the North Atlantic Treaty Organization, the symposium attracted 140 participants, 34 of whom were from the United States. Other nations taking part included the United Kingdom, Canada, Denmark, France, Germany, Greece, Italy, the Netherlands and Norway.

Indicative of recognition accorded the U.S. Army's progress in laser research was the presentation of two invited papers and 25 contributed papers. Prof. C. H. Townes, who early introduced the idea of the laser while engaged in research at Columbia University, and Dr. R. B. Watson, U.S. Army Research Office, Office of the Chief of Research and Development, were among invited speakers.

Presentations at the symposium served to establish that the United States has a considerable lead among Free World nations in development of lasers. Whereas several hundred laser research activities are being conducted in the U.S., only about 25 percent are reported for the other nations, with France and the United Kingdom making the major effort.

Basic research on lasers is being conducted by the U.S. Army through its in-house laboratories and through contracts and grants with educational institutions, nonprofit research organizations and industry. Applied research programs are being directed to specific military applications including communications, surveillance and target detection, tracking, guidance and seeking of missiles, data processing, range findings, night vision, surveying, mapping and geodesy, and metallurgy.

Stahr Outlines Balance of Industrial Profits

PROVOCATIVE PONDERABLES, a popular column of the *Army R&D Newsmagazine,* 15 years ago, included statements and excerpts from prominent personalities, many of which are considered as timely now as they were then, such as stated by Secretary of the Army Elvis J. Stahr Jr.

"Although industry must make money in order to survive in a free country, and although industry must survive in order to keep the country free, industry must not drive the government into economic weakness by inefficient and unnecessary cost or profit practices. The national interest includes the interests of industry, but not those alone."

Scenes From Atlanta IV Army—Industry Executive Seminar

AMERICAN DEFENSE Preparedness Association Vice President (GEN, USA, Ret.) Henry A. Miley Jr., former DARCOM commander; GEN John R. Guthrie Jr., DARCOM commander, in his first Atlanta Seminar appearance; John D. Blanchard, DARCOM assistant deputy for Materiel Development; Dr. Percy A. Pierre, Assistant Secretary of the Army, Research and Development.

ATO CO. PRESIDENT Alfred V. Gangnes, Willoughy, OH; (l. to r.) James M. Stone, group vice president, Government Systems, Thiokol Corp.; GEN John R. Guthrie Jr.; GEN (USA, Ret.) John R. Deane Jr., former DARCOM commander; Altanta Mayor Maynard Jackson, as photographed at buffet dinner and reception.

STERLING INSTITUTE President Gregor MacFarlane; former Chief of Army R&D LTG (USA Ret.) Austin W. Betts, now vice president, Operations, Southwest Research Corp.; LTC G. J. Quirke, UK Liaison Office, HQ DARCOM; Brigadier J. Peter Ferry, British Defence R&D Attache, Washington, DC; Fred Jacobs, manager Defense Products Department, Caterpiller Tractor Co.

VICE PRESIDENT and general manager of Northeast Division, Maremont Corp. Berge Thomiasien; Ivor S. McFarlane, president, McFarlane Associates Inc.; BG Jere W. Sharp, director, Procurement and Production, HQ DARCOM; James F. Maclin, assistant deputy, Materiel Readiness, DARCOM; BG Stan R. Sheridan, PM for MICV; MG Geoffrey Bruch (CB), Ministry of Defence, London.

POSING PROUDLY with DARCOM Commander GEN John R. Guthrie Jr. are young materiel procurement specialists who served on a panel (l. to r.) John Gerlach, Office of PM for Fighting Vehicle Systems; Maureen Cook, HQ ECOM; Brenda Kiaer, HQ AVSCOM; Zane Phillips, Missile R&D Command; William Street, Armament Readiness Command.

INDUSTRIAL PARTICIPANTS (l. to r.) Elmer Sipp, manager, Government Dept., Union Carbide Corp.; Vincent J. Murray, manager Bristol Plant, Raytheon Corp.; COL Edward M. Browne, PM for AAH; John T. Jensen, marketing manager, J&L Products; Lincoln Hudson, director of Engineering, Honeywell Corp.; R. E. Brix, director, Ordnance Division, N. B. Hirsh, deputy program manager, AAH, and Thomas R. Stuelpnagel, all with Hughes Helicopters.

FORMER Assistant Secretary of the Army for Research and Development Robert L. Johnson, currently president of McDonnell-Douglas Astronautics Corp.; an astronautics company representative, unidentified; MG Charles F. Means, former project manager for the Patriot missile system, now commander of the Army Missiles Research and Development Command.

Former Under Secretary of the Army Norman R. Augustine, now vice president for Technical Operations with Martin Marietta Corp. who presided as moderator of one of the discussion panels, is shown at a luncheon with Army Chief of Staff GEN Bernard W. Rogers, who was the principal speaker.

MISSILE R&D COMMAND Laboratories were presented an Army Award for Excellence in recognition of management, program and resources, by LTG George Sammet Jr., DARCOM Deputy CG for Materiel Development. Dr. John L. McDaniel, deputy and technical director, accepted the award. Shown at left is Dr. Julien Kobler, technical and laboratory director.

GEN Guthrie Calls for Dedicated Team Effort for DARCOM Mission

Ovational response to GEN John R. Guthrie from large crowds assembled for formal assumption of command ceremonies at historic Fort Myer, VA, May 18 - and at a joyous reception later at the Cameron Station Officers' Club - demonstrated to DARCOM's new commander that they shared his feeling of "coming home after 3½ years."

Army Chief of Staff GEN Bernard W. Rogers presented the DARCOM organizational colors to GEN Guthrie after presiding at change-of-command ceremonies during which he paid a warm tribute to the 55-year-old general's progressive achievements since 1942.

Together GEN Rogers and GEN Guthrie marched for inspection of the 3d Infantry "Old Guard" Fife and Drum Corps, the U.S. Army Band, and troops of the 1st Battalion (Reinforced) 3d Infantry.

Other dignitaries present included new Assistant Secretary of the Army (RDA) Dr. Percy A. Pierre and Mrs. Pierre, new Assistant Secretary of the Army (I&L) Alan J. Gibbs and GEN Henry A. Miley Jr. (Ret.), former commander, Army Materiel Command, now president, American Defense Preparedness Association.

ASSUMPTION OF COMMAND SPEECH. Thank you for the honor you pay us in the United States Army's Materiel Development and Readiness Command today. Your presence highlights for each of us - those here as well as the 110,000 other military and civilians, men and women of the command stationed around the world - the importance of DARCOM's contributions to our Army's readiness and, through it, to our national security.

It has been slightly over 3½ years since my last assignment to the command responsible for the development, production, distribution and support of Army materiel. While I recognize, as I assume command of DARCOM, that I am returning to a different organization with a different name, please forgive me if I say, nevertheless, that I feel that I am coming home - home to old friends, both within DARCOM and without, both in the Army and in her sister services, both in the Department of Defense and in industry; and home to a mission which is essentially the same as that of the Army Materiel Command which I left.

We must still be creative in order to develop and produce new hardware to meet new threats. We must still be objective when we test that equipment to make sure that it does its job effectively, simply and reliably. We must still be innovative in our fielding and careful in our support planning to insure that field troops can use and keep equipment in a ready condition.

In short, we must be determined, as ever, to put into the hands of our soldiers the hardware they need - and then to service and support it!

Yet, *while its mission may be essentially the same,* DARCOM's responsibilities have been vastly expanded. Today it is a military organization with military responsibilities extending from here at home all the way to the demilitarized zone in Korea and the Iron Curtain in Europe. It is also a big business which must be capable of interacting effectively with industry, both at home and off shore.

One can only contemplate these responsibilities - and the challenges they present - humbly and with a sense of dedication. And so, General Rogers, I accept this command and the responsibilities that go with it in that spirit.

I pledge to you, once again, that with the help of all the dedicated professionals on the DARCOM team, we will continue to do our best to insure that your Army maintains that high level of readiness that you have every right not only to expect but to demand.

DARCOM COMMANDER GEN John R. Guthrie, wife Rebecca and three of six children, Michael, 25 (left), Claire, 28, Kevin, 15, John, 23, Peter, 19, Margaret, 18, are university students.

FIRST OFFICIAL VISIT of GEN Guthrie to Aberdeen (MD) Proving Ground, as DARCOM commander, included test firing of 155mm gun. Discussing the firing sequence with the General are (left) Neil Gray, gun-crew leader, and test directors Gil Denn and Kenneth Ruff, all with the APG MTD.

But we cannot go it alone - we are but one member of the Army team - and that is why we are so grateful to the Army Band - Pershing's own, and the 3d Infantry - the Old Guard who have so capably represented here today those other members of the Army team that we, in DARCOM, support. Our special thanks to them for their usual splendid performance.

IN A SUBSEQUENT STATEMENT to DARCOM personnel, GEN Guthrie said: I want to emphasize that our role is to support the Army team. We must do whatever is necessary to ensure the readiness of the total Army in peace or in an emergency. I believe we should not be concerned with who gets the credit but rather with seeing that the job gets done in the quickest, most economical and decisive manner.

The measure of success DARCOM enjoys in meeting the Army materiel development and readiness objectives will depend largely upon two factors: the zeal, determination and competence of each individual member of the command, and our ability as individuals to act together as a team. Only by pulling together in support of mutually understood objectives can we do the job with the resources we now have.

Communication and understanding, vertically and horizontally, are vital to our success. We must relate DARCOM's objectives and plans to each member of the team clearly and concisely; and insure the flow of information and suggestions to the decision makers.

Understanding how our command is performing its mission is a matter of highest priority with me. To gain that understanding, I intend to travel to find out first-hand how the command is operating, learn how new programs and policies are functioning, and find out if we are accomplishing our missions efficiently, effectively and economically.

In all these, Equal Employment Opportunity has high priority. We must use all the talent available to us to its maximum, and we can do this only if employes-regardless of race, sex, age and background-are convinced that they have a fair chance. This means, of course, that our minority, promotion, awards and opportunity policies must be sound, concerned, impartial.

During my 35-year military career I have received no greater honor than the privilege to serve as your commander. I promise you my personal dedication and full support.

Biography in brief. GEN Guthrie was commander of the IX Corps, U.S. Army in Japan, when he was selected as the new DARCOM commander and promoted to 4-star rank Apr. 30 at Camp Zama, Japan. After GEN John R. Deane's retirement Feb. 1, LTG George Sammet Jr. served as DARCOM commander until GEN Guthrie took over.

Commissioned as an ROTC honor graduate from Princeton University, where he later served as an assistant professor of Military Science, GEN Guthrie graduated from the Command and General Staff College in 1944, and from the National War College in 1961.

Following duty as Special Security Representative to the Supreme Commander, Allied Forces, Japan, during World War II, GEN Guthrie returned for a second tour with the War Department General Staff in the Pentagon. He was integrated into the Regular Army in July 1946.

Upon his return from duty as commander, 25th Infantry Division Artillery, Schofield Barracks, Hawaii, he was assigned in July 1965 to the Requirements and Development Division, J-5 Directorate, Organization of the Joint Chiefs of Staff, Washington, DC. Then came a tour as director, Developments, Office of the Chief of Research and Development, HQ DA, until he was sent to Korea in 1967.

Returned to the States in November 1968, General Guthrie served first as deputy director, Research, Development and Engineering, U.S. Army Materiel Command; then became director Aug. 1, 1969, Research, Development and Engineering. In April 1971 he was named Deputy CG for Materiel Acquisition, HQ AMC, serving until he was assigned in October 1973 as deputy chief of staff, U.S. Pacific Command, Camp H. M. Smith, Hawaii. He was designated CG of the IX Corps U.S. Army, Japan, in March 1975.